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PROGRESSIVE MEDICINE

A QUARTERLY DIGEST OF ADVANCES, DISCOVERIES
AND IMPROVEMENTS

IN THE
MEDICAL AND SURGICAL SCIENCES

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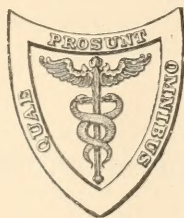
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VOLUME I. MARCH, 1922

SURGERY OF THE HEAD, NECK AND BREAST—SURGERY OF THE THORAX, EXCLUDING
DISEASES OF THE BREAST—INFECTIOUS DISEASES, INCLUDING ACUTE
RHEUMATISM, CROUPOUS PNEUMONIA AND INFLUENZA—
DISEASES OF CHILDREN—RHINOLOGY,
LARYNGOLOGY AND OTOTOLOGY



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PROGRESSIVE MEDICINE.

MARCH, 1922.

SURGERY OF THE HEAD, NECK AND BREAST.

By CHARLES H. FRAZIER, M.D.

Brain Tumors. As time goes on we see and remove a larger percentage of brain tumors. A series of 8 successfully removed growths are reported with Spiller,¹ selecting cases which represented different types of tumors and different locations. The majority presented interesting and unusual features either in the history or operative findings. There were no fatalities. For details the reader should consult the original.

DIAGNOSIS. In his analysis of the incidence of general convulsions in a series of 165 cases of brain tumors, MacRoberts concludes that this symptom points to a tumor of the temporo-sphenoidal lobe.

Character.	Cases.	Location of tumor.	Cases.
Major epileptic seizures	4	Temporo-sphenoidal	3
Localized Jacksonian spasms . .	11	Postparietal area	1
Generalized convulsions without unconsciousness	3	Frontal involving motor area . .	6
Localized Jacksonian spasms occa- sionally accompanied by uncon- sciousness	4	Parietal near motor area	5
		Temporo-sphenoidal	2
		Intraventricular with extreme hydro- cephalus	1
		Frontal, involving motor area . .	4

In this statement he is not referring to Jacksonian seizures, with loss of consciousness, which here he does not think has any significance. The typical generalized epileptic seizures he found not only a frequent complication of tumors of the temporo-sphenoidal lobe, but in his own series the convulsions occurred almost exclusively in tumors of this location. Speculating as to the possible relationship of cause and effect, MacRoberts attributes the convulsions to the effects of compression of the Sylvian artery by the tumor, since it has been claimed that a sudden reduction of the cerebral blood supply may cause convulsions.

I do not know that I altogether agree with Bériel² in his statement that gliomatous tumors are more apt to be associated with a higher degree of intracranial pressure than the endotheliomata. While the latter may cause, by pressure, some brain atrophy, they grow by displacing

¹ Archives of Neurology and Psychiatry, November, 1921.

² Lyon Medical, vol. 129.

tissue rather than by replacement, as with gliomata. Bériel goes on to say that he believes the gliomatous tumor inoperable in the ordinary sense and advises decompression over the site of the tumor without opening the dura.

VENTRICULOGRAPHY. The ventriculogram is one of the newer things in intracranial procedures. Its field of usefulness is still undetermined. Personally, I have used it with indifferent success. When first proposed by Dandy, in connection with his studies on hydrocephalus, I ventured to suggest that it might be of value in the localization of tumors. In my clinic we have been disappointed in our attempts at localization by this method, hence I was particularly interested in the experiences of McConnell¹ who really obtained very suggestive evidence from this source although in none of the 3 cases reported was he able to remove the tumor. Still, his contribution is very well worth while, and I would refer those interested to his original article. Briefly, the following are the locations of the tumors and the interpretative signs of the ventriculogram.

1. A tumor on the superior surface of the left cerebellum. Evidence: Obliteration of posterior horn of left ventricle from pressure of tumor subtentorial.

2. Tumor of the frontal lobe. Evidence: Occlusion of the anterior horn of ventricle on the corresponding side.

3. Cyst of occipital lobe. Evidence: Posterior and descending horns of ventricle occluded.

There are certain difficulties in technic attending the injection of air; for example, one is never quite certain whether there has been any leakage. We have discussed with Pancoast, our roentgenologist, the possibility of substituting for air some inert solution, which like barium in the gastro-intestinal tract, would throw the necessary shadow. Pancoast believes this is a perfectly feasible proposition and it remains to find in the experimental laboratory an inert substance that will fulfill the requirements.

I suppose we must be prepared for the indiscriminate application of the ventriculogram. With the introduction of any new diagnostic method, it is often indiscriminately applied and not until definite indications are prescribed by those competent to judge does the method find its proper place. Not only do we find the ventriculogram indiscriminately applied, but, with lack of experience, there must inevitably follow erroneous interpretations. I could refer to illustrative cases in my own experience were it necessary. Menninger,² after eliciting the symptoms of a cerebellar lesion, injected air into the child's ventricles. To quote him, he says "as the roentgenograms show, the diagnosis of cerebellar tumor was adequately justified." Why? "In the first place there was an obvious hydrocephalus." This appears to be enough as there was no second place. The "obvious hydrocephalus" is, of course, not exclusively characteristic of a cerebellar lesion, and in this particular case was of no assistance in localization.

¹ Dublin Journal of Medical Science, April, 1921.

² Archives of Neurology and Psychiatry, April, 1921.

Horrax¹ reports an adaptation of this technic which is interesting. His patient presented signs of a lesion in the right postcentral region. Exposure revealed a gliomatous cyst. This cyst was largely evacuated and then filled with air. X-ray studies, completed at once, "showed a large cyst running downward and probably inward about the size of a duck's egg. Four days later a second stage operation was undertaken. At this session the air was evacuated from the cyst and a good transcortical exposure of the cyst secured. Its walls were retracted and at its inferior angle a nubbin of solid glioma was seen about the size of a hickory nut. This nubbin was removed as completely as possible and closure made without drainage. The patient made an uneventful recovery." The injection of air into the cyst showed just where it was most accessible to transcortical incision, its size and general position.

Dandy² would have us believe that every tumor can, and should, be localized in the early stages. This, of course, is a preposterous statement. One half of all brain tumors, he says, can be accurately localized by routine examinations and in the other half the ventriculogram will give us the precise location or exclude the existence of tumor. It goes without saying that there are a number of instances in which, in the early stages, in the first weeks or months or even a year, there is not the slightest evidence of a tumor much less any precise information as to its localization.

No one familiar with the pathology of tumors and the associated disturbance of the cerebrospinal fluid will question the assertion that information of value may be derived from the topography of the ventricles. However, the casual reader will get a very false impression of the surgical problems of brain tumor, if he accepts the statement that it is possible now to diagnose and localize *practically every tumor in the early stage*. To the reader, who may be uninformed in this highly specialized field, it is not fair to gloss over the many insuperable obstacles to accurate diagnosis and localization.

Bailey³ suggests a plan for the *clinical classification of brain tumors*. He points out the great difficulty in comparing statistics from different clinics because of the great variation in classification. There is unquestionably room for improvement in this direction for it is only through reducing statistics to a common basis that accurate contrasts can be made. The outline he uses is as follows:

1. Brain tumor suspects.

- A. Clinically non-tumor.

Cases admitted as brain tumor which, after thorough study, were not so regarded.

- B. Clinically doubtful.

Cases admitted as brain tumor in which the findings were doubtful but operation was performed and no evidence of tumor found.

¹ Archives of Neurology and Psychiatry, June, 1921.

² Journal of the American Medical Association, No. 24, vol. 77.

³ Archives of Neurology and Psychiatry, April, 1921.

- C. Clinically tumor
 - Clinically localizable tumor, but operation, although exposing the location, disclosed no evidence of tumor.
- D. Verified non-tumor
 - Clinically localizable tumor, but pathological lesion determined and absence of tumor verified at necropsy.
- 2. Brain tumor, unverified.
 - A. Unoperated.
 - B. Unlocalized.
 - Decompressed to relieve pressure symptoms.
 - C. Undisclosed.
 - Explored but no lesion found.
- 3. Brain tumor, verified.
 - A. At operation.
 - B. At necropsy, unoperated.
 - C. At operation and necropsy.
 - D. At necropsy, unverified at operation.

This outline, while valuable, does not go far enough. Nothing is said of the pathology disclosed in the verified cases. The outline used in my clinic might well be appended to it to make the record complete: Pretentorial.

A. Benign tumors:

- 1. Fibroma
- 2. Osteoma
- 3. Enchondroma
- 4. Tuberculoma
- 5. Miscellaneous

B. Malignant tumors.

- 1. Glioma
 - (a) Cortical, subcortical
 - (b) Infiltrating, circumscribed
- 2. Endothelioma
- 3. Miscellaneous

C. Pituitary lesions.

D. Miscellaneous.

Subtentorial.

- 1. Acoustic tumors
- 2. Angle tumors (not acoustic)
- 3. Hemispheric growths
 - (a) Endothelioma
 - (b) Fibroma
 - (c) Glioma
 - (d) Tuberculoma
 - (e) Miscellaneous.

This combination of the two classifications would afford a basis for intelligent discussion and for the parallel studies of reports from various sources.

Hubschman¹ investigated THE RELATIONSHIP BETWEEN BRAIN TUMOR AND TRAUMA OF THE CRANIUM. In 107 cases in which the histories were accessible, 17 per cent showed trauma as a possible factor. In 6 per cent of these, however, the injury was slight, or head symptoms were noted before the injury occurred. In the remaining 11 per cent there were a number in which the relationship between accident and tumor was doubtful. In but 3 per cent of cases did necropsy show evidence of previous injury. The author quotes G. B. Gruber to the effect that the latter found no case in his war material in which a blastoma could be, said to be directly due to trauma but the possibility of quickened growth, with manifestation of a heretofore existing occult glioma, is admitted.

In this connection 2 cases of intracranial telangiectasis reported by E. M. Hammes² are interesting. Both cases gave a definite history of injury. Operation revealed enormously dilated bloodvessels on the pia resembling in the second case a nest of bluish angle worms. These vessels were ligated in several places. Both cases eventually recovered almost completely. The outstanding features in this connection are: "Jacksonian epilepsy at long intervals in a non-syphilitic with unconsciousness of long duration, no evidence of intracranial pressure, slow progression of symptoms, and telangiectases on the head or face." The 2 cases quoted did not show this feature. Surgical interference gives a hopeful prognosis, although tying off the engorged bloodvessels often gives rise to alarming symptoms.

BRAIN TUMORS AND RADIUM. What palliative measures are open to us when faced by an inoperable growth? From a surgical standpoint we may combine a decompressive opening with our osteoplastic flap by removing the bone from the base of the flap and the adjoining skull, or a separate unilateral or bilateral subtemporal opening may be made. This procedure is particularly appropriate in the cases of pseudo tumor, in unlocalizable growths, or other conditions causing increased intracranial pressure.

The use of radium and x-ray is the other possibility. During the past year there have been two experimental studies carried out to discover the effect of radium upon brain tissue. Williamson, Brown, and Butler³ inserted radium into the brains of dogs "with the idea of determining as accurately as possible the safe dosage, the radius of activity and the degree of reaction produced by a given amount of radium upon normal brain tissue in a known period of time." The radium was placed over the motor cortex so that functional disturbances, as well as structural lesions, might be determined. These workers found that "the application of radium to the brain of the dog under certain limitations as to time and strength has a destructive action, but produces no clinical symptoms. The radium, in these experiments, was enclosed in a platinum tube of approximately 0.4 mm. thickness, which removed the alpha and practically all the beta rays, but permitted the passage of the gamma rays.

¹ Deutsch. Ztschr. f. Nervenhe., May 26, 1920, No. 1, vol. 66.

² Archives of Neurology and Psychiatry, September, 1921.

³ Surgery, Gynecology and Obstetrics, September, 1920, No. 3, vol. 31.

"The difference in the effects produced at different distances from the tube is of extreme interest. Thus, within a radius of 4 mm. of the tube a twelve hour exposure produces complete destruction of the brain cells and the interstitial tissues with the products of degeneration scattered throughout, but more thickly at the periphery. The bloodvessels within this area, on the other hand, show marked thickening and hyalinization of their walls without rupture. Surrounding this there is a zone 1 mm. wide in which many of the cells are not completely destroyed but do show evidence of degeneration. In this zone the bloodvessel walls are not thickened but degenerated. As a result of this degeneration, they rupture, and one sees an encircling zone of hemorrhagic infiltration, 1 mm. in width. This zone is very well outlined and ends abruptly in what appears to be normal tissue, in which the only evidence of the reaction to radium is the slight hyperemia without changes in the bloodvessel walls. In none of the sections was there any cellular infiltration except from the hemorrhage, and no evidence of beginning repair.

"The time required to destroy malignant tumor cells will depend upon the milligram hour dosage administered on the one hand, and on the other the distance of the outermost cells from the radium and the susceptibility of the tumor cells to its action. It has been proven that six hundred milligram hours with gamma rays alone will kill cancer cells to a distance of 1 cm. Twice this distance, or 2 cm. requires four times that dose. Sarcomata usually do not require so much dosage. The exact amount required in the case of brain tumors will depend largely on experience, always bearing in mind the law of inverse squares when considering dosage and the size of the tumor. If a dosage is employed presumably just sufficient to destroy a brain tumor of any given size and one which responds to radium *readily*, we may assume from the above experiments that the exposure of the normal brain tissue just beyond the growth is not likely to be of any serious consequences.

"In conclusion we find that:

1. The gamma rays after passing through 0.4 mm. of platinum penetrate brain tissue and have a destructive action within a radius of 5 mm., with a dosage of nine hundred milligram hours.
2. The effects upon the bloodvessels varies according to the distance from the radium and the number of hours applied.
3. The above experiments give assurance that, in the case of those brain tumors which respond *readily* to radium, little or no damage will be inflicted upon the brain tissue surrounding the tumor, if the radium is implanted in the growth. The dosage employed on the growth can be regulated so as to be destructive only to the periphery."

Bagg¹ conducted a series of animal experiments to determine three points. 1. The nervous tissue reaction of the normal brain after exposure to radium emanation, from a histological standpoint. 2. The question of dosage and safety. 3. The most practical method or methods of applying the radiation. The results of these experiments showed "1. The characteristic localized radium destruction was

¹ Transactions of the New York Neurological Society, Archives of Neurology and Psychiatry, March, 1921.

the most marked feature of the method wherein small amounts of unfiltered radium emanation were embedded in brain tissues. This effect was accompanied by pronounced polymorphonuclear leukocytic infiltration, which surrounded a completely necrotic area of brain tissue. The amount of destroyed tissue was about 1 cm in nearly all cases, generally exactly that amount, seldom less, and never more than 1 or 2 mm. more in diameter.

"2. A considerably greater amount of destruction accompanied larger doses of unfiltered radium emanation, left in the brain for shorter periods of time, although the dose, as judged by the number of millicurie hours was the same for the small doses, which acted over a comparatively long period.

"3. Comparatively slight, if any, brain changes followed exposure to strong doses of heavily filtered external application of radium emanation, although such doses were considered of sufficient strength materially to affect the cells of a brain tumor.

"It is interesting to note that a considerable amount of brain tissue was destroyed by the first method, without the animals showing any discernible neurological disturbances, even though they were under observation for over six months, but that when the same dose in number of millicurie hours was given by means of a comparatively large amount of radium emanation, acting over a short period of time, the neurological reactions accompanying this more severe and rapid destruction were pronounced and generally terminated fatally a few days after treatment.

"Of the four methods that have been tested, one may consider the surface application of heavily filtered radium emanation as a relatively safe procedure in the treatment of brain tumors. The burying of small doses of unfiltered radium emanation is also suggested as an especially favorable method of treatment. The relatively sudden destruction produced by comparatively large doses of unfiltered radium emanation makes this method a doubtful procedure. While the embedding of filtered radium emanation is still uncertain, it is possible that by using still larger doses than were employed in these experiments, and decreasing the filtration, this method might also be considered applicable."

Ewing,¹ basing his opinion on the results of radium in different types of tumor, claims that the effect of the radium depends upon the histological structure of the tumor. When the tumor is cellular in character, with an undifferentiated form of cell, many mitotic figures showing rapid growth, absence of much intercellular substance and marked vascularity as shown by many delicate capillaries, it is susceptible to radium. In contradiction to this type, when the new growth is made up of a differentiated adult type of cell of slow growth and showing but few mitotic figures, with much intercellular substance and an adult type of bloodvessel, the tumor is relatively unsusceptible. Neurofibroma or neurosarcoma presents features of the resistant tumor, an unfortunate fact, because of its frequency. Endotheliomata, especially psammomata and true angio-endotheliomata or periepitheliomata, should, from

¹ Transactions of the New York Neurological Society, Archives of Neurology and Psychiatry, March, 1921.

their structure development, be controllable by roentgenotherapy. Gliomata of all the tumors of the brain and spinal cord present most of the structural features that favor susceptibility to radium. These growths, from their lack of encapsulation, secondary effect on surrounding brain tissue and rapidity of development are the most unfavorable for surgical extirpation. If such a tumor is discovered at operation, the tissue should not be disturbed by any attempt at partial excision, but it should be treated by direct application of radium or the insertion of emanation necoles. This statement of Ewing's is evidently based purely on theoretical considerations, at least insofar as tumors of the brain are considered. As a matter of fact, in our experience the infiltrating gliomata have not responded as well to roentgenotherapy as other types. Encapsulated gliomata may often be removed *in toto* surgically, but the infiltrating type must be dealt with by other methods. To treat intracranial growths rationally with radium, it is necessary to know the type of growth to be treated, the amount of radiation required in the treatment of such growths and the size of the growth from center to periphery where the tumor is actively proliferating if central implantation is practised. If the growth is irregular in outline it is necessary to guard carefully against possible damage to surrounding brain tissue. In the present status of our knowledge in this field, it is best to give an underdose by implantation and to supplement this by cross-firing from the outside of the head. We group our tumors in the following manner for treatment.

1. Tumors found at operation and which cannot be removed. A moderate dose of radium may be applied by implantation of the tube in the center of the growth, and this supplemented by cross-fire radiation from the outside of the head.

2. Tumors found at operation and partly removed. These may be treated in the same manner.

3. Tumors not localized and not found at operation or inaccessible at operation. Such tumors may be treated by cross-fire radiation from the outside of the head in all possible directions. This may be done apparently without any danger to normal brain tissue.

4. Pituitary growths may be treated after decompression, after partial removal or at a time subsequent to operation when there is a recurrence of symptoms. The technic we employ has been the application of radium below the sphenoid sinuses for a period not sufficient to cause serious damage to the structures in this neighborhood. This is supplemented by cross-fire radiation with roentgen rays through each temporal region toward the hypophysis.

The question of the treatment of brain tumors by radium is still *sub judice*. Much careful clinical observation and experimental work is necessary before definite, clean-cut rules for its use can be formulated.

Salt Solution and Intracranial Tension. In the course of operative procedures upon tumors of the brain, one of the most difficult conditions with which the surgeon must deal is that of increased intracranial tension. If the dura is tight, it is dangerous to open it, for the high pressure may force the cortex out through the incision, with disastrous effect.

A cortical hernia prevents an attempt to reclose the dural opening. At times, even when the dura is not particularly tense when first opened, the operative manipulation may cause the brain to swell and herniate. There are three methods of overcoming this unfortunate situation. First, by puncture and drainage of the lateral ventricles. This should be done, if indicated, in every case before the dura is opened. Frequently one cannot reach the ventricle for the tumor may have collapsed or displaced it. Second, a transplant of fascia lata may be sewn to the gaping dural edges to close in the defect and to prevent further herniation. Third, the brain may be dehydrated and diminished in size by the intravenous administration of salt solution. It is this method of reducing intracranial bulk which interests us most.

Last year, I discussed the effect of the injection of a concentrated saline solution upon intracranial tension, reviewing the experiments of Weede and McKibbon¹ and citing the clinical experience of Sachs,² who I believe is credited with the first published clinical report. Weede and McKibbon, while working experimentally on cats, noticed that the administration of saturated salt solution resulted in a dehydration of tissues and a shrinking in the volume of the brain. Sachs reported a case into whose veins during an operation salt solution was injected in the hope that intracranial tension would be decreased sufficiently to allow closure of the dura. Dehydration and consequent diminution in the size of the brain resulted to such a marked extent that it was possible to remove a large tumor and close the dural incision without difficulty. Since that time the subject has attracted a good deal of attention among neurological surgeons and no doubt during the past year in many of the clinics, as in mine, this method of dealing with intracranial tension has been applied in many instances. It is a matter of regret that, up to the present time, the results of these various clinics, with but one exception, have not appeared in the current journals.

Foley³ describes his experience in the Peter Bent Brigham Hospital with 9 cases; in 5 there was a tumor without dilatation of the ventricle and in 4 there was a ventricular hydrocephalus with tumor. A water manometer was connected to a lumbar puncture needle and the spinal puncture performed. Once the manometer connection was established and the intraspinal pressure determined, the patient was given either sodium chloride in capsules by mouth or an intravenous injection of 15 per cent sodium chloride solution. The intraspinal pressure began to fall almost at once and continued to decline, until within an hour after the salt entered the system it was reduced to a half its former height. This experiment apparently shows conclusively that the administration of salt solution, given either intravenously or intra-orally, will reduce the amount of intraventricular fluid. An attempt was made to measure the actual loss of brain bulk due to the absorption of fluid from the cerebral tissue itself. Patients were selected who had a hernial protrusion following a palliative subtemporal decompression. A plaster cast was

¹ American Journal of Physiology, 1919, **48**, 512.

² Journal of the American Medical Association, 1920, **75**, 667.

³ Surgery, Gynecology and Obstetrics, August, 1921.

made of the swelling, a toy balloon placed inside the cast with its stem projecting outward from a hole in the center of the cast. The cast, with the balloon lying inside it, was applied tightly to the hernia and strapped in place. The stem of the balloon was attached to a water manometer. Any diminution in the size of the hernia and consequent expansion in the enclosed balloon could thus be noted exactly. With the oral ingestion or intravenous transfusion of salt solution, the hernial protrusion decreased in size, the balloon filled with water and the manometer pressure fell.

In discussing the effects of dehydration by salt solution, Foley distinguishes between fluid tension *per se* and increased tension from enlargement of brain bulk. In the former, obstruction to fluid absorption is the primary and essential feature. In either case the pressure of the brain against the skull diminishes the volume of the subarachnoid spaces and obstructs the absorption of fluid through the arachnoid villi. Under these circumstances little is to be expected from the use of salt solution. When, however, the pressure is due to a ventricular hydrops, the results are striking since the fluid, Foley says, can be absorbed from within the ventricles. Upon what basis or evidence he makes this assertion I should like to know. The generally accepted view maintains that little absorption occurs within the ventricles. When the intracranial tension is due to increased brain bulk without ventricular hydrops, relief may be obtained only when the subarachnoid spaces are not obliterated; and *per contra*, when the fluid spaces are obliterated little should be expected from any attempt at dehydration. Foley has had no experiences with dehydration in inflammatory lesions of the brain but believes that in the presence of an edematous brain, even though the subarachnoid spaces be obliterated, dehydration would probably be pronounced.

This dehydrating process has many applications. In the first place it may be employed as a means of relieving pressure in the course of an exploratory operation when the operator is hampered by excessive intracranial pressure and the ventricles are collapsed or cannot be evacuated. Again, it has been found effective in the relief of the terrific headaches of brain tumor, especially when associated with hydrocephalus. Foley suggests another indication in cases in which it is desirable to make a lumbar puncture for diagnostic purposes under conditions of extreme pressure. By the process of dehydration, the dangers of the procedure may be obviated. The difficulties in the administration of the anesthetic so often met with in cases exhibiting marked degrees of tension can, in part, be overcome, particularly in cerebellar operations. After decompression, one can determine whether the hernial protrusion is due chiefly to an internal hydrocephalus or not. If to a hydrocephalus, the protrusion will practically disappear; if to a solid growth, the protrusion merely becomes softer. His experience in trying to tide over periods of acute pressure has not been striking.

It is in this connection particularly that I have found the method disappointing. For example, after operations upon patients with gliomatous tumors, whether it be a decompression or merely an explora-

tory craniotomy, the patient in certain instances passes into a stupor and succumbs. The underlying pathology, it is presumed, is a spreading edema. One would have thought that under these emergency conditions saline solution would be almost a specific. Such, however, has not been my experience. Also in severe cerebral contusions, where edema is believed to play an important role, one would have anticipated very positive results from the use of saline solution, but here again I have been disappointed. So that, while in certain spheres the method is effective, in others it is a failure. It would seem, in reviewing our experiences, that only when there is free fluid in the subarachnoid space and ventricles is the method at all helpful. When the fluid is represented by a tissue edema, the method has not met our expectations.

With regard to the technic, the following is the dosage and method of administration, in the 9 cases reported by Foley.

1. Adenoma of pituitary. Dosage: 50 cc 15 per cent solution, intravenously. Object: to relieve headache.

2. Suprasellar growth. Dosage: 100 cc 15 per cent solution, intravenously over a period of twenty-two minutes. Object: to relieve pressure during operation.

3. Glioma of hemisphere. Dosage: 15 grams in capsules with a little water. Object: to relieve signs of marked tension after a decompression.

Ditto. Dosage 80 cc, 30 per cent solution by nasal tube. Object: to relieve Cheyne-Stokes respiration.

4. Presumptive cerebral tumor. Dosage: 50 cc 15 per cent solution. Object: to relieve severe headache.

5. Lesion of left hemisphere. Dosage: 16 grams in capsules in a little water. Object: to relieve tension at time of a decompression.

6. Pituitary cyst. Dosage 80 cc 15 per cent solution, intravenously. Object: to relieve headache and delirium.

7. Cerebellar tumor. Dosage: 100 cc 15 per cent solution intravenously. Object: to relieve headaches and stupor.

8. Cerebellar glioma. Dosage: 16 grams in capsules with 80 cc of water. Object: to relieve intense headache.

9. Cerebellar cyst. Dosage: 120 cc 15 per cent solution intravenously. Object: to relieve headache.

From these it will be seen that in the majority of instances the administration of sodium chloride was directed toward the relief of headache or other signs of intracranial pressure, either before or after an operation. Inasmuch as the effects are only transitory, we must admit that up to the present time this much heralded therapeutic measure is little more than a plaything in our hands. Perhaps, with continued observation and research, we may find by modifications of administration that this dehydrating process may have a wider field of application and be of greater assistance in the solution of some of the problems of intracranial surgery. The following are Foley's conclusions:

1. In the human subject intravenous injection of hypertonic salt solution or the ingestion of salt produces a fall of cerebrospinal fluid pressure and a diminution of brain bulk.

2. In conditions of pathologically increased tension, the response is conditioned by the details of the pathological alterations. The determining factors appear to be the size of the lesion which increases brain bulk and the amount of fluid available for absorption. The induced fall of pressure is inversely proportionate to the former and directly proportionate to the latter.

3. A distinction is made between increased intracranial fluid tension *per se* and increased intracranial tension which is due to enlargement of brain bulk.

4. From observations of cases of obstructed and dilated ventricles an intraventricular absorption of fluid following salt ingestion seems to occur.

5. The procedure has a definite field of clinical usefulness in cases exhibiting high grades of intracranial pressure. The most striking results are to be obtained in those cases in which cerebrospinal fluid obstruction exists.

Pituitary Gland. In his interesting discussion of *disorders of the pituitary*, Cushing¹ calls a halt on what he terms "polypharmaceutical charlatanism" as applied to the haphazard prescribing of glandular extracts. In the case of pituitary disturbance he says we are not far from the tumor stage and with regard to the therapeutics of pituitary disorder we are still in the path-breaking stage of surgery. As to the surgery of the pituitary body Cushing says he is conducting proportionately fewer rather than more transphenoidal operations, though in favorable cases with a large ballooned sella he believes the latter to be the simplest and easiest method, the one most free from risk and most certain to lead to a rapid restoration of vision. In suprasellar lesions, especially if the sella be not enlarged, the approach from above is necessary.

Locke² advises the *transphenoidal approach* only when there is a distended sella easily approachable from below. In a series of 27 cases, 15 were operated upon through the nose and 12 by the transfrontal route. He recognizes the fact that in the latter even in the best of hands the mortality is admittedly high. He meets the criticism that intracranial extensions of the pituitary lesion cannot be dealt with effectively from below with the statement that an extension of the tumor through the sellar base into the sphenoidal cells is inaccessible from above.

After discussing the merits of the *transfrontal* and *transsphenoidal approach* with inclinations toward the latter, Henry³ describes an instrument which he believes will be helpful. The instrument is quite too complicated for me to describe, save to say that it is attached by a clamp to the roof of the mouth and floor of the nose and has a tubular extension like an urethroscope through which the sphenoid sinus and sella turcica are opened. In order to determine the proper angle of approach to the sphenoid sinus, an x-ray is taken before the operation with the instrument in place, and one or more exposures made during the operation.

¹ Journal of the American Medical Association, No. 25, vol. 76.

² Archives of Neurology and Psychiatry, June, 1921.

³ Dublin Journal of Medical Science, April, 1921.

On this account the operation must be conducted in the x -ray laboratory. The instrument is a most ingenious one but I doubt whether it will ever be employed by those with a reasonably large experience in this field. In the first place, there is obvious objection to the conduct of an operation in an x -ray laboratory; second, the contracted space through which the operator works is a distinct handicap; and, third, if the topographical relations of the sphenoidal sinus to the sella turcica have been studied roentgenologically before the operation, the experienced operator should have no difficulty finding his way into the sinus and through it to the sella turcica. However, as I said above, the instrument is ingenious and may appeal to others more than it does to me. Hence those who are interested in the technic of the transphenoidal approach should consult the original article and study the illustrations and text.

The *effects of traumatic lesions upon the pituitary body* is touched upon by Reverchon¹ in his review of a patient who had sustained a fracture through the posterior part of the sella turcica. At the autopsy, there was not the slightest trace of the normal pituitary body, which had been replaced with fibrous tissue. In addition to the evidences of hypopituitary disorder, expressed by mental infantilism, lethargy, asthenia, polydipsia and polyuria, the fifth, sixth and seventh nerves had been injured on both sides.

In the treatment of what he calls *pituitary headache*, Redwood² recites his experience with the administration of pituitary extract in 11 cases. Of this number 7 had small sellas, closed in by the clinoid processes, and 4 had normal sellas. Eight patients were entirely cured or greatly relieved, and 2 were not benefited. Some of the patients suffered from other conditions, such as diabetes insipidus and convulsive seizures.

Pineal Gland. Without reduction of the intracranial tension, operations, such as Dandy³ describes, for the removal of pineal tumors become impossible. Any procedure which involves dislocation of the cerebral or cerebellar hemisphere demands evacuation of the ventricle before sufficient exposure can be obtained. Pineal tumors lie in as central a position in the brain as can well be imagined. The cerebral hemispheres must be rendered capable of marked retraction before enough of the growth and its surroundings is seen to make removal feasible. Dandy first tried to reach the tumor by a subtentorial approach without success. He then determined to reach the growth from above, pulling the hemisphere to one side and following down the falx.

"The approach to the tumor is made possible by a very large parieto-occipital bone flap, the mesial margin of which extends to the superior longitudinal sinus. The exposure of this sinus is frequently a relatively bloody procedure because of the venous lakes, which are usually both large and numerous, and the control of hemorrhage must be quick and effective. If the bone flap does not extend to the mid-line, a secondary defect must be rongeuured away from the mesial margin of bone until the sinus is reached. The dura is then opened and reflected over the inferior

¹ Presse Médicale, 1921, No. 29, p. 741.

² Virginia Medical Monthly, April, 1921.

³ Surgery, Gynecology and Obstetrics, August, 1921, No. 2, 33.

longitudinal sinus. In doing so, the cerebral veins which bridge the subdural space between the brain and the longitudinal sinus are gradually elevated, doubly ligated with fine silk ligatures, and divided. The number of these veins in the necessary field of operation varies from one to six, or even more. It is well, if possible, to avoid ligation of the Rolandic vein for a transient hemiplegia will follow. Usually, however, it is necessary to add that, for this reason and because of possible speech disturbances, the craniotomy should be performed on the right side; and because tumors of the pineal body are always in a strictly central position, exposure of the growth is equally easy on either side. In the case in which the tubercle was removed, the tumor was approached from the left side because a deforming operation had been previously performed on the right. No speech disturbances followed in this case, although there was a weakness of the right side for several days.

"After division of the cerebral veins, the entire posterior half of the cerebral hemisphere can be retracted and the falx exposed. The inferior longitudinal sinus is quickly passed and the corpus callosum brought into view as the brain is still further retracted. This part of the operation is bloodless, and is quickly and easily accomplished. Until now there is no evidence of an underlying tumor. The posterior half of the corpus callosum is then carefully incised in the mid-line for a distance of 3 or 4 cm. and the hemispheres still further retracted. The tumor will then be brought into full view. Under the fornix of the corpus callosum, the vena Galena magna will always be brought into full view at its entrance into the sinus rectus. In one of the cases here reported, the tumor lay anterior to the large vein of Galen and between it and the corpus callosum. In the other case about one-half centimeter of the great vein of Galen was free between the upper margin of the tumor and the beginning of the sinus rectus, an amount sufficient to permit double ligation and division of the vein between the ligatures. In the first case the tumor stripped readily from the vein, and no bleeding resulted from the dissection. After the tumor was extirpated the great vein of Galen was seen as a tortuous trunk which, when straightened, would probably measure 4 cm. in length; the third ventricle was not opened during the enucleation of the tumor. The bed from which the tumor was removed was the roof of the third ventricle and its appearance was exactly like the photographs seen in text books showing the small veins of Galen on either side of the mid-line running a straight longitudinal course of probably 5 cm. before they were again lost in the substance of the brain.

"In the second case the tumor was so large that an adequate exposure was obtained only by dividing the falx cerebri (and with it, of course, the inferior longitudinal sinus). It was then possible to retract the brain to both sides. Each small vein of Galen was carefully dissected where it crossed from the tumor to the brain and divided between silk ligatures. Several small tributaries of these veins were separately tied and divided as they emerged from the tumor. No dissection was made blindly; the tumor was gradually enucleated with ease. During the removal of this tumor the third ventricle was opened and the tumor extended so deeply

that the operator's finger reached the posterior clinoid process of the sella turcica. It will be evident from the ability to tie ligatures at this great depth and from the deep dissection of the tumor, which lay immediately over the posterior clinoid processes, that the operative exposure was probably sufficient. A great deal of this room is afforded by the release of fluid from the lateral ventricle by a puncture early in the operation. The hydrocephalus while so destructive of brain tissue has its compensating benefits in the amount of fluid which can be released, thus allowing the reduced bulk of brain to be easily retracted from the operative field. Were it not for the release of fluid not only would the exposure of the tumor be very difficult but the necessary retraction of the brain would be injurious to the cerebral hemisphere."

Trigeminal Neuralgia. INCIDENCE. At other times I have commented upon the fact that major trigeminal neuralgia, for some reason or other, is appearing more frequently among young adults, that is in those in the second and third decades, and occasionally one meets with a patient still in the teens. Now comes the report¹ of an apparently genuine case of a boy aged eleven years. I say apparently, although the history and the character of the attacks would seem to admit of but one diagnosis, as in the author's words: "He was having excruciating 'epileptiform' attacks of pain on the right side of the face, accompanied by twitching of the right facial muscles, every two or three minutes (typical 'tic douloureux'). During a preliminary examination, lasting about ten minutes, he had four severe spasmodic attacks of pain; these chiefly involved the second division of the fifth cranial nerve (mostly infraorbital branch), but also to a less extent the third division of the nerve (mostly inferior dental branch). The first or ophthalmic division was not affected. During the attacks the boy screwed his face up, and pushed his hand hard on to his face. His mother stated that when the pain came on at first he moaned and groaned, but later it became so severe that he screamed out and frequently disturbed the neighbors. During the two days he was in the hospital before the operation he had no sleep. Ordinary sedatives were useless. During the spasms there was flushing of the right side of the face, and also some increased lachrimation and salivation. Eating or speaking, or any excitement, provoked attacks. Pressure on the angle between the right ala nasi and the cheek also brought on a spasm—the mother stated that he had to be very careful in washing his face, and that he would not allow her to do it. Sitting in front of a fire also excited the spasms."

The boy was reported free from pain seventeen months after the operation although the operation was in no sense a radical one, but consisted solely in the intracranial division of the second and third divisions of the trigeminal nerve. Why the operator was content, once the ganglion was reached, with a operation which almost inevitably in time will be followed by a recurrence, is hard to understand. A peculiar complication was observed after the operation; at least I have never seen it in my entire series of intracranial operations. There was

¹ Barclay: British Journal of Surgery, October, 1921.

contraction of the pupil and narrowing of the palpebral fissure, which the operator attributed to an injury to the cavernous plexus of the sympathetic fibers which supply Müller's muscle in the eyelids and the dilator papillæ in the iris. There was also paralysis of the corrugator supercilii but this was readily explained by the misplaced cutaneous incision, which divided a branch of the facial nerve.

PATHOLOGY. We are just as much at sea as ever with regard to the pathogenesis of trigeminal neuralgia. Nothing has been added to our knowledge of the pathology of the Gasserian ganglion since Spiller's¹ original contribution. Within the year Bailey² recorded his observations upon 11 ganglion specimens in only 1 of which, however, had there been no previous operative interference. Apart from certain senile changes in the connective tissue and parenchyma, the specimens were essentially normal. In the face of this negative evidence, Bailey concludes that the essential lesion must be in the nerve endings. This, however, can be accepted only as a hypothesis, as there is no confirmatory evidence. Personally, I do not believe in the peripheral theory, that is in the theory of a peripheral neuritis, for reasons which I shall not repeat here.

TECHNIC. There have been no radical revisions of the major operation—avulsion of the sensory root. It remains the accepted procedure as the safest and most satisfactory measure of permanent relief. Coughlin³ has employed local anesthesia and demonstrated its feasibility. There is no doubt that cranial procedures can be carried out under local anesthesia; the scalp, pericranium and dura, if necessary, can be desensitized, and penetration of the brain itself is painless. But from the standpoint of the patient's comfort and ease of mind, I question whether what may be a tedious and somewhat prolonged operation should be performed on the conscious patient. If, as a measure of greatest safety, local anesthesia was urged as a substitute for general anesthesia, I would gladly accept the substitute. But in view of the fact that ether anesthesia does not add to the operative risks, and the mortality of the radical operation has been reduced to an almost inconsequential figure, I am not prepared to adopt local anesthesia either for the radical operation on the sensory root or any other intracranial procedure as a routine practise.

McEvoy⁴ describes a simple incision for operations on the Gasserian ganglion. The incision is represented as a simple oblique incision through the skin, fascia and muscle, but the essential feature of the incision is the cross cut in either direction in the temporal fascia just above the zygoma. This enables the margins of the wound being separated sufficiently to give adequate exposure. This cross cut I have employed in both skin and fascia for a number of years.

It seems hardly worth while to refer to a method of approaching and cutting the root with the aid of a special cystoscope. Jeanneney⁵

¹ *Journal of Nervous and Mental Diseases*, 1898, **25**, 400.

² *Archives of Neurology and Psychiatry*, August, 1921.

³ *Surgery, Gynecology and Obstetrics*, October, 1921.

⁴ *Ibid.*, March, 1921.

⁵ *Jour. de Med. de Bordeaux*, 1921, No. 10, p. 275.

describes a subauricular and retromastoid route. Needless to say, the writer's experience seems to have been limited to the cadaver. The idea could not have been conceived by one experienced with ganglion operations on the living subject.

In a contribution to the *Surgery of the Trigeminal Tract*, I¹ have introduced several modifications of the standardized technic and will refer here to three (1) subtotal resection of the sensory root, (2) resection of the motor root, (3) conservation of the motor root. By subtotal resection of the motor root, I imply leaving the inner fasciculus of the root intact. We recognize trophic keratitis as a complication of varying incidence following the radical operation. To be sure, when recognized promptly and treated properly, the epithelium rapidly proliferates and within forty-eight hours the defect in the cornea is repaired. But can we eliminate this complication altogether? Possibly by leaving one or two of the inner fasciculi of the root intact. We know there are subdivisions of the ganglion corresponding to each of the peripheral divisions, ophthalmic, maxillary and mandibular. May there not be corresponding representations of those subdivisions in the root? I believe there are, and if the portion of the root corresponding to the ophthalmic division is not divided, one might assume with reason that corneal complications may be altogether eliminated. One presupposes, of course, that this subtotal resection would be appropriate only when pain was not referred to the first division. I wish now merely to put on record a series of cases in which this modification of the radical operation was practised within the last two years. Up to the present time, there has been no recurrence; but before approval or acceptance, the operation must stand the test of a longer period of time. Should there be an expression of pain in those cases now under observation, any merit the operation might otherwise have would have to be disregarded. It is not at all a difficult matter to isolate the innermost fasciculus of the sensory root as implied in subtotal resection. The sensory root having no sheath is of very loose texture. One can readily see with the naked eye the individual fasciculi, and with a suitable instrument, one can separate the fasciculus to be conserved from those to be divided.

Resection of the motor root is proposed for the relief of certain cases of trismus, those analogous in many respects to facial tic or spasm. The feasibility of dividing the motor root and conserving the sensory I² have demonstrated in one case, an account of which will be found in the original contribution.

Conservation of the motor root is a refinement of the radical operation that should commend itself to the surgeon seeking an ideal cosmetic and functional result. By conserving the motor root, atrophy of the temporal, masseter and pterygoid muscles is avoided. So far as the atrophy affects movements of the jaw, it is a matter only of inconvenience. But atrophy of the temporal muscle left a depression above the zygoma quite noticeable and prevented what otherwise would have

¹ Journal of the American Medical Association, October 29, 1921.

² Loc. cit.

been accepted as a perfect cosmetic result. To meet this objection, some surgeons went so far as to resect the zygoma.

Although I have maintained that it is not difficult to conserve the motor root, I find neurological surgeons quite content to continue with the original technic in which the motor is sacrificed with the sensory root. With a little patience and a little additional time, the motor root may be conserved in four out of five cases.

When the sensory root is adequately exposed, in the course of the operation, it is elevated from its bed with a blunt instrument. Usually the motor root may be seen in contact with the skull, traversing the space behind the root and disappearing behind the ganglion. If recognized or suspected, the electrode is applied; and should it prove to be the motor root, the fibers of the temporal muscle, exposed to view in the wound, will contract. Sometimes at this preliminary inspection the motor root will not be seen because, cleaving to the sensory root, it has been lifted up by the instrument with the sensory root. Under these circumstances, I make segmental sections of the sensory root, beginning with the outer fasciculi, and search for the motor root after each section. Usually when half of the sensory root has been divided, one can recognize the motor root as it passes behind the ganglion. But to confirm the observation, the electrode is used. If these directions are followed, the motor root may be conserved in the majority of instances. It has escaped me occasionally, but with continued effort and experience, I believe it will be possible to save the root in every instance.

ALCOHOLIC INJECTIONS. It is rather refreshing to find a teacher in a dental school stressing the futility of attempting to relieve trigeminal neuralgia by any dental procedure—the removal of impacted teeth, evacuation of dental abscesses, the removal of pulp stones or extraction of teeth. “No dental disturbances are capable of producing a single case of trigeminal neuralgia.” Silverman¹ makes an interesting contribution to the treatment of trigeminal neuralgia by alcoholic injection. He maintains that the buccal branch of the inferior maxillary division, though very often affected, is hardly ever recognized as the offending branch. Not only is it the seat of the paroxysmal pain, but irritation in the zone of its distribution is the frequent origin of pain reflected to the distribution of other branches, notably the infraorbital, inferior dental, auriculotemporal, etc. The buccal nerve is a nerve of appreciable size and supplies the buccinator muscle. The latter divides at the corner of the mouth, the upper fibers passing to the upper lip and the lower to the lower lip. “The buccal nerve, being surrounded by and occupying the middle ground of the other sensory branches, lends itself to stimulation on the slightest provocation. Thus, because of its course as it is given off from the anterior root of the inferior maxillary division, it is easily disturbed by the mere opening of the mouth. Talking, eating or sipping brings the buccinator muscle into play, and this is sufficient to bring on a paroxysm. Touching the cheek from within or without the mouth, shaving, washing or wiping the cheek is sure to start a paroxysm.

¹ Journal of the American Medical Association, No. 23, vol. 77, p. 1802.

To make the diagnosis more obscure, the buccal nerve will "mirror" itself so that to the operator it appears to be definitely this or that branch. Usually he is almost certain that either the infraorbital or the mandibular is the affected branch. I know that my readers, like myself, have reoperated or reinjected a certain area time after time until the patient was, like ourselves, discouraged and exhausted. The pain not only persisted but became accentuated in its severity. These patients were, if operated on by capable neurosurgeons, finally relieved by intracranial operations."

While the buccal nerve is often not the first to be involved, Silverman has found that in recurring cases alcoholic injection of this nerve will give immediate relief. To inject the nerve, a mouth gag is inserted on the affected side. The patient is instructed to pucker the lips and draw the upper lip downward. This makes the coronoid process conspicuous both to palpation and vision. The needle is inserted through the cheek just beneath the most prominent portion of the zygoma and advanced backward to reach the inner surface of the tip of the coronoid process.

Speaking of alcoholic injections in general, Silverman maintains that peripheral injections are more effective than the deep injections of the mandibular and maxillary divisions, because only the peripheral twigs are affected and the deep injections are superfluous. I cannot agree with him either in his principal contention nor in the explanation therefor. He uses a needle of 42 mm. lumen and pure alcohol with a few drops of formaldehyde added. In the injection of the infraorbital branch he is uniformly successful and his patients free from pain for over one year. The same may be said of injections of the supraorbital, supratrochlear and the lingual branches. To obtain relief for more than one year in 100 per cent of cases is an achievement which up to the present time no one else has claimed. It, therefore, excites one's admiration. However, Silverman acknowledges to a less than 100 per cent result in the mandibular branch, which is comforting to those who admit of failures in all branches. The mandibular branch, when affected, should, he says, be removed intra-orally as it obviates a scar and facilitates the removal of the incisive, labial and mental twigs. On what basis he has arrived at the conclusion that recurrences are due much, if not more, to anastomosis than to regeneration is not stated. Certain it is that in recurrent cases one is able to demonstrate a regenerated nerve, whereas there is no evidence at hand to prove that anastomosis plays any part.

In the form of a thesis, which rather suggests the inexperience of the student and lack of judgment that goes with experience, Van Allen¹ proposes a transorbital puncture of the Gasserian ganglion as a substitute technic for the Härtel and other methods. He tells us that the Harris and Härtel technic are uncertain in execution and that there are dangers to be considered. "The zygomatic fossa is crowded with important structures." This statement alone seems to me very much of an exaggeration, but when advanced as an argument in favor of a trans-

¹ *Annals of Surgery*, November, 1921.

orbital route in which the author admits the cavernous sinus, internal carotid artery and temporal lobe may be injured, it seems scarcely worthy of refutation. Should anyone be courageous enough to follow Van Allen's steps, I refer him for the details to the original article. In over half of his experiments on the cadaver the needle passed through the cavernous sinus. This the author admits might lead to a sinus thrombosis, but after all, he says, the thrombosis would be aseptic, and at the worst might be followed by a pulmonary embolism! Apart from this, it is, he says, difficult to conceive of injurious consequences. However we are told the internal carotid artery lies only 0.5 cm. mesial to the line of penetration.

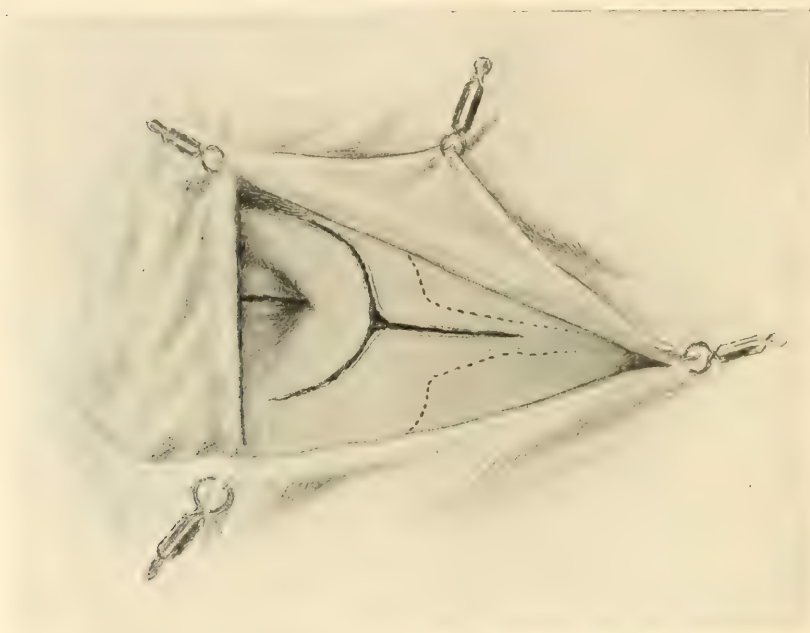


FIG. 1.—The incision in relation to the orbit and the zygoma.

Sphenopalatine Neuralgia. There has been much discussion of late as to the origin of certain types of neuralgia which differ in many respects from major trigeminal neuralgia. One of these types for various reasons has been identified with the sphenopalatine ganglion as the seat of the lesion. The whole matter is still *sub judice*, and it has been suggested (Frazier) that were it possible to excise this ganglion in patients, presumably suffering from sphenopalatine neuralgia, their relief from pain would give us the most convincing evidence. With this in mind, I¹ have planned a surgical approach to the ganglion, and have performed the operation in 2 instances. The steps of the operation are as follows:

1. The incision (Fig. 1) has been designed with due regard for its

¹ Annals of Surgery, September, 1921.

cosmetic effect and to avoid important branches of the facial nerve. There are three limbs, one straight, in the direction of the zygoma, and two curved, following the lines of the supra- and infraorbital ridges. With careful apposition of the margins of the wound, the healed scar is quite inconspicuous. The branches to the orbicularis palpebrarum and the occipitofrontalis have not been disturbed.

II. Upon reflection of triangular flaps (Fig. 2) the malar bone is exposed, and, with a Gigli saw, three sections of the bone are made: (1) through the frontal process; (2) through the maxillary process, and

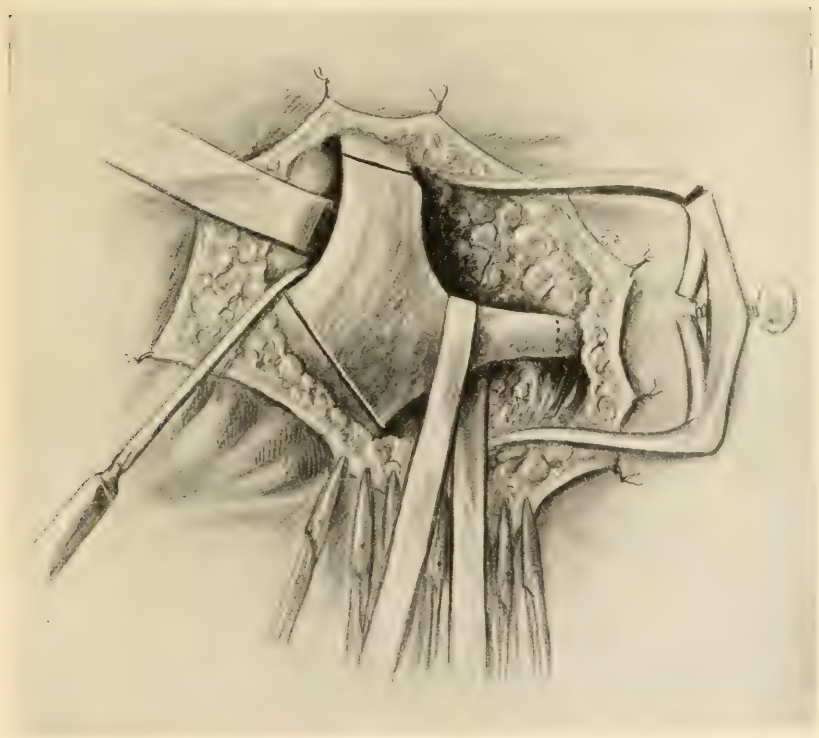


FIG. 2.—The isolation of the zygoma and malar bone. (a) Malar bone sectioned above and below. (b) Dotted line represents the point at which zygoma is divided with Gigli saw from within outward, leaving the outer periosteum intact.

(3) through the zygomatic process. To make sections 1 and 2, the Gigli saw is passed through the sphenomaxillary fissure. At section 3 the zygomatic process is sawed only partly through, the outer shell and the periosteum being left intact. Thus an attachment is conserved which prevents any dislodgment of the malar bone when replaced at the completion of the operation.

III. The malar bone reflected backwards (Fig. 3) at once exposes to view the zygomatic fossa and its areolar tissue. One sees in the anterior portion of the wound the external aspect of the orbit.

IV. A clearing of the contents of the zygomatic fossa is made now to expose the pterygoid plate (Fig. 4.) This is accomplished by following closely the surface of the posterior wall of the antrum and displacing backward and downward the areolar tissue and the temporal muscle. Before the pterygoid plate is exposed to view the internal pterygoid muscle must be detached.



FIG. 3.—The malar bone reflected backward uncovering (a), the fat and muscle tissue in the zygomatic fossa; (b), a portion of the orbital contents.

V. With rongeur forceps a portion of the pterygoid plate is removed and the contents of the sphenomaxillary fossa exposed. To find the sphenopalatine ganglion one should expose first the maxillary division, as it enters the orbit through the sphenomaxillary fissure, and follow it up to the ganglion. The ganglion itself is deeply placed in the sphenomaxillary fossa, close to the sphenopalatine foramen. Surrounded by fat it is not readily seen, hence the necessity of following the course of the maxillary division as a guide.

There are no insurmountable difficulties; the approach to the ganglion is the most direct; the cosmetic results are entirely satisfactory; the

operative field is peculiarly free from any source of troublesome bleeding. The only difficulty with which the operator may be confronted has nothing to do with the approach and exposure of the sphenomaxillary fossa but rather with the comparatively small dimensions of the ganglion. If, however, one uses as a guide the maxillary division (it is readily seen entering the sphenomaxillary fissure) the nerve if followed will lead one to the ganglion.

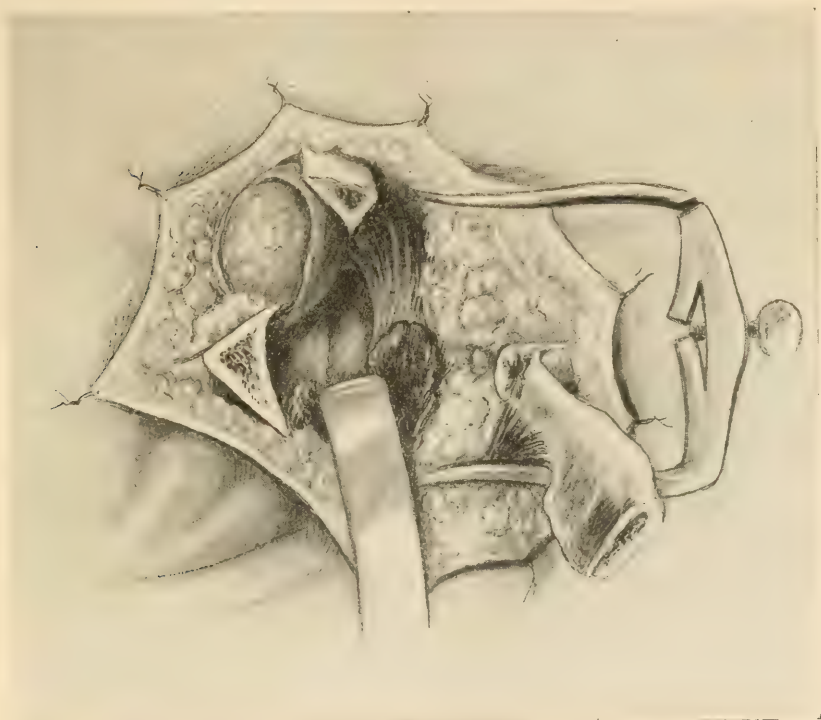


FIG. 4.—(a) Temporal muscle is retracted downward exposing wall of antrum.
(b) Internal pterygoid muscle, above, intact.

Occipital Neuralgia. I have never seen a case of occipital neuralgia where the pain was comparable to that of *tic douloureux* or violent enough to call for a radical operation. Hence I was somewhat surprised to see that Oehlecker¹ had extirpated the second spinal ganglion in 10 cases. One patient died of meningitis, but, in the remaining 9 the operation was followed by excellent results. The ganglion of the second cervical nerve, from which the occipital nerve is given off, is the only spinal ganglion without the spinal canal. I have removed a number of times the ganglion in the course of an operation for spasmodic torticollis and quite agree with the writer in his statement that the operation is one of considerable difficulty. In fact, I know of no more complicated dis-

¹ Deutsch. Ztschr. f. Nervenhe., 1921, 69, 296.

section than that for the exposure of the origin of the first three cervical nerves but of these three, the second is much the largest and the most easily identified. This method of dealing with an aggravated form of occipital neuralgia is quite logical and the difficulties of the operation should not be regarded as a contraindication if the operator is at home in this rather infrequented anatomical field.

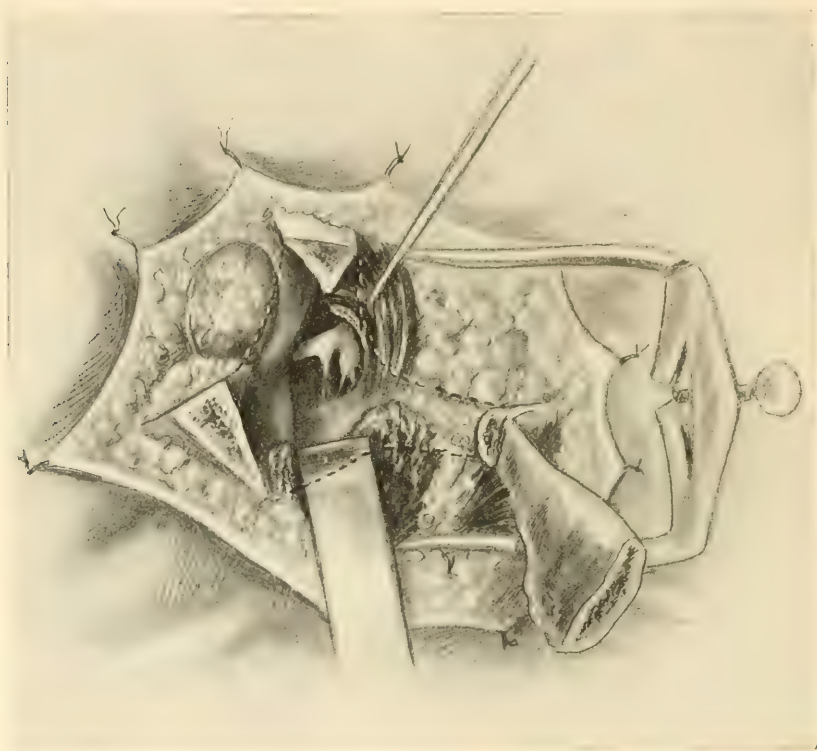


FIG. 5.—I. The internal pterygoid muscle is displaced upward. II. Pterygoid plate has been removed in part with rongeur forceps. III. The sphenopalatine ganglion and the maxillary division of the trigeminus are exposed to view.

Cranial Injuries. **FRACTURES IN CHILDREN.** As pointed out by Moorhead and Weller,¹ in their review of the end-results in 100 cases of fractured skull in children, it is a well recognized clinical fact that children withstand the immediate and late effects of head injury better than adults, a fact accounted for, as the writers suggest, by the greater elasticity of the skull in children. Complete formation of the skull does not take place until the sixteenth or seventeenth year, so that head injuries occurring before puberty ran a more favorable course than in adult life. The resiliency of the skull protects it to a marked degree from the bursting or crushing effects which have serious consequences in later life. On the other hand, complications during convalescence, the

¹ *Annals of Surgery*, July, 1921.

eruptive fevers and pneumonia or meningitis, from a latent otitis media, from adenoids or nasopharyngeal infections are more common following cranial trauma in childhood.

The mortality reported in this series is low; 5 per cent in fractures of the vault, 10 per cent in basal fractures and 11 per cent in fractures involving both base and vault—a total of 26 per cent. In 80 per cent of all fatal cases there was involvement of the base.

As to the diagnosis of fracture of the skull in children, one should bear in mind that meningeal hemorrhage is less common in children than in adults. It is particularly difficult, however, in children to differentiate between a hematoma and a depressed fracture. If in doubt, the authors advise free incision and inspection or finger palpation to determine whether or not a fracture is present. X-ray evidence in children is less reliable than in adults, because of the prominent suture lines, the variability in the thickness of the bones and the difficulty in keeping a child quiet while the exposure is being made. A spinal tap which produces fluid uniformly stained with blood, an uneven admixture may mean nothing, shows that sufficient injury has occurred to contuse the brain but does not necessarily prove the presence of a fracture. The examination of the eye-grounds offers little of diagnostic value and blood-pressure readings are of less importance in children than in adults.

Moorhead and Weller divide their cases into four clinical groups:

Type I. (a) Concussion plus vault fracture; (b) concussion plus basal fracture; (c) concussion plus vault and base fracture.

These cases are more or less conscious on arrival at the hospital; a hematoma or definite fracture line is demonstrable in the vault group; hemorrhage from the orifices is apparent in the basal group or a late ecchymosis (conjunctival, pharyngeal or retromastoid) makes the diagnosis with or without corroboration by spinal tap, neurological, eye, ear or x-ray findings. This is the commonest group and most cases recover unless intracerebral pressure is marked or meningitis occurs.

Type II. Concussion plus latent interval, plus focal symptoms (at first irritative and later paralytic) plus definite or indefinite signs of vault and base fracture. This is an unusual group in children, and with or without operation the prognosis is bad.

In adults this clinical combination can occur without skull fracture; but in children, fracture is almost inevitable.

Type III. Concussion plus persisting coma, plus definite signs of vault or basal fracture (or both) with convulsions, spasticities, high temperature, rapid pulse, embarrassed respiration and exitus. This is a sequel of severe injury with brain laceration, and, from a surgical relief standpoint, little can be done or even expected.

Type IV. Concussion plus vault or base fracture (or both) plus evidence of intracerebral pressure (due to bone, blood, fluid or foreign bodies). These are the cases on the borderline as they present some of the evidences pertaining to the three types already mentioned, particularly Types I and II. The differential diagnosis as between this type and meningitis is exceedingly difficult, and in alcoholic adults with the same symptom-complex, alcoholic serous meningitis often proves to

be the correct diagnosis. X-ray, neurological, ocular and spinal fluid examinations are most valuable in this group, and the decision as to operative interference is often thereby determined. Most of these cases die and those recovering often given demonstrable evidences of mental deficiency with or without peripheral or cranial nerve defects.

The differential diagnosis is not particularly difficult except in Types I and IV, in which concussion and meningitis are respectively confusing. In this connection it is pertinent to say that concussion means *immediate temporary unconsciousness, usually associated with vomiting*. If the elements of *immediate onset with temporary duration* do not exist, then the condition is not true concussion.

As to the treatment, the patients were kept absolutely quiet until all objective signs disappeared. Urotropin was administered routinely, and bromides when necessary. Weak antiseptics were instilled into the nose and ears twice daily. Elimination was forced. As in all intracranial injuries the judgment of the attending surgeon is taxed chiefly as to the propriety of operative intervention. The most important indication, of course, is an increase of intracranial pressure. The extent of the cranial injury may be of relatively little moment. The degree of intracranial pressure is the dominant factor in determining the necessity for operation.

The amount of spinal fluid to be removed after tapping must be carefully considered. The first insertion of the needle into the canal should not be for diagnostic purposes only. Much may be done to relieve intracranial pressure by accurately controlled removal of fluid. The normal pressure in the canal is 8 to 10 mm. of mercury. Sufficient fluid should be removed to reduce the pressure over half or if the original pressure is less than 20 mm. of mercury, to reduce it to normal. There is one distinct contraindication to permitting the escape of large quantities of fluid. If the stream from the needle spurts vigorously at first but the pressure very rapidly, on the withdrawal of only 4 or 5 cc, falls to normal or below, it is dangerous to evacuate more fluid. This condition of sudden relaxation of intraspinal tension shows that there may be a blockage of the free flow of the cerebrospinal fluid through the basal foramina. This obstruction prevents the intracranial fluid from passing freely back into the spinal canal to equalize the pressure above and below the foramen magnum. If the pressure above the foramen is greater than that below this point, the vital centers about the pons and medulla may be forced against the bony ring of the foramen with disastrous results. The foraminal cone on the lower part of the cerebellum and about the medulla and pons sometimes seen at autopsy in cases of brain tumor with very high intracranial pressure, demonstrates the after-effects of the downward thrust once the support from below is gone.

Billet¹ recommends immediate bilateral subtemporal decompression to relieve the supraforaminal tension if the patient becomes worse after the fluid is removed. [This recommendation without further qualifica-

¹ Progrès Méd., July 9, 1921, 36, 323.

tions cannot be endorsed. I have never seen a foraminal hernia relieved by a subtemporal decompression and I doubt whether it has been successful in other hands. If the symptoms are alarming, the foot of the bed should be elevated and the patient put in the face down position. If still the respiration is seriously embarrassed, it may be necessary to do a suboccipital decompression and relieve the pressure at the foramen magnum. Supratentorial decompressions in these foraminal herniæ will have little, if any, effect.] However, as blockage at the basal cisterna is not a common sequel of fractured skull, lumbar puncture under the control of the manometer may, with propriety, be recommended. I am not at all sure, as the author states, that in a certain number of cases lumbar puncture will obviate the necessity of a subtemporal decompression. In the majority of cases the most that can be hoped for is relief of headaches.

Records of pulse-rate and pulse-pressure (difference between systolic and diastolic blood-pressure) should be kept and charted. As previously emphasized in *PROGRESSIVE MEDICINE*, it has been the practise in our clinic to resort to a subtemporal decompression only when the intracranial pressure, in spite of the free removal of fluid, is not reduced and when the pulse-rate in beats per minute falls to the level of the pulse-pressure read in millimeters of mercury. The clinical picture will also show signs of increase of intracranial tension. With the proper interpretation of the clinical picture and the pulse-pressure records, not only are unnecessary operations avoided but the case is not allowed to pass beyond the point where the operation will afford relief.

As to the question of operating for the relief of pressure, Bodewig¹ raises an interesting point. It has been proven time and again at autopsy that a subtemporal decompression permits the expansion of the lateral ventricle through the cranial defect. Presumably, this lateral expansion relieves the vital centers at the base from harmful pressure against the margin of the foramen magnum. If now a suboccipital craniectomy were performed in preference to, or at least in conjunction with, a subtemporal decompression, and if the rim of the foramen magnum and, if indicated, the transverse process of the atlas and axis were removed, would not the severe basal pressure-effects in great part be avoided? The free drainage afforded produces palliation of symptoms in chronic hydrocephalus. Clinical experience proves this beyond a doubt. Whether the same result would occur in acute cases of intracranial pressure remains to be seen. Bodewig does not review any cases to support this suggestion, as she was dealing with chronic cases only. One should not take this recommendation too seriously. Theoretically a suboccipital decompression would be more effective than a subtemporal decompression but the operation is a much more formidable one and for this and other reasons should not be recommended as a routine procedure.

To return to the question of cranial injuries in children, in the series of 100 cases, 12 operations were performed, 9 in fractures of the vault,

¹ Beiträge zur klinischen Chirurgie, Tübingen, 1921, 121, 1.

and 3 in combined basal and vault fractures. Four of the 12 cases died, 2 of these in the combined basal-vault group.

The sequelæ of head injuries are, as a rule, more transient and less severe in children than in adults. Motor paralysis and paresis are very often recovered from even after apparently destructive lesions. Cranial defects in children show a decided tendency to close spontaneously. The importance of questioning the traumatic origin of epileptiform seizures in children, even after head injury, is noted. Unless the injury involves a part of the motor cortex that seems related to the seizures, and unless the seizures are distinctly Jacksonian in type and come on within six months of the injury in a child whose heredity is untainted, the cranial injury is probably not the causative factor. Operations for the removal of scar tissue or adhesions are notoriously unsatisfactory in their ultimate results and should only be undertaken on very clean-cut indications.

Eagleton¹ thinks the treatment of cranial injuries should be in the hands of the neurological surgeon. The general surgeon in his treatment of cranial fractures too often considers only the emergency without regard for the after-effects, which may render the patient more or less unfit to return to his routine existence. Contusion of the brain and infiltration of blood into the cortex excites proliferation of new connective tissue. Once this structural change takes place, call it a gliosis if you will, operative or medicinal treatment is of no avail. Headache, muscular palsies, traumatic epilepsy, are unfortunately frequent sequellæ.

For practical purposes, Eagleton divides fractures of the skull into two classes, simple and compound. The surgical problems presented by these two types are fundamentally different and should be dealt with accordingly. In simple fractures the treatment is directed to the relief of the increased intracranial pressure and to the prevention of gliosis; in the compound fractures, in addition to these two factors, the prevention of intracranial sepsis is an urgent consideration. While the surgeon can do nothing to repair contused or lacerated brain tissue, Eagleton believes he may aid Nature in the repair of the damage or he may prevent more extensive infiltration by relieving the increased intracranial tension. To prevent infection, all scalp lacerations should be opened widely and debrided as soon as possible; for the presence or absence of an underlying fracture may thus be determined and a potentially infected wound rendered fit for closure.

The importance of postponing any radical treatment of the head injury until the patient has recovered from shock is emphasized. All too often before the patient has recovered from shock a house officer, keen to make a diagnosis, subjects the patient to a complete neurological examination, rolls him about, uncovers him and exposes him to chilling. Or, and this is a fatal error, his blood-pressure is not taken and he is subjected at once to a decompressive operation, merely because he has signs of a fractured skull. Such treatment would lead to disaster.

¹ Archives of Surgery, July, 1921.

With a diastolic blood-pressure below 55 mm. Hg the patient should not be disturbed except for the control of hemorrhage and the treatment of shock, using warmth, elevation of the bed, stimulation and, best of all, blood transfusion. Transfusion will not increase the blood-pressure sufficiently to increase the intracranial bleeding. Even though it might, it is invaluable in the treatment of shock and increases the prospect of recovery should an operation be necessary.

The importance of a complete neurological examination of all cases of fractured skull is unquestioned. Apart from the value of the information so derived in determining the seat of fracture in localizing the cerebral injury or in eliciting the indications for treatment, a thorough examination will aid one in noting progression or retrogression of symptoms and in formulating an opinion as to the prognosis.

I subscribe quite willingly to all that Eagleton emphasizes in the study and treatment of cranial injuries. I am not quite so skeptical, however, as to the mismanagement of these cases on the general surgical service of our hospitals. The younger generation of house officers and surgeons has received instruction in accordance with our present conception of the treatment of head injuries and I have found them as a rule pretty well informed.

In connection with the diagnosis of intracranial lesions, Besta¹ calls attention to the effects of the injection of pilocarpine. Apparently, pilocarpine accentuates all the symptoms attributable to the injury, inducing spasms or Jacksonian seizures, causing lacrimation or salivation, exaggerating the mental picture and by its effect on the autonomic vegetative system, arousing symptoms which had become latent. It is said that the administration of ether subsequent to a brain injury exaggerates the symptoms. The administration of pilocarpine not only does this, but brings to light further significant facts of value in localizing the lesion. If further clinical experience confirms this therapeutic action, the drug should be helpful in the study of obscure cases.

CRANIOPLASTY. In civil surgery the repair of cranial defects is a comparatively rare procedure. In the reconstruction hospitals, during the war and afterwards, surgeons were confronted repeatedly with this problem. All methods of repairing these defects have been tried, including the use of foreign material, such as gold, silver or mica plates, strips of rubber or paraffin. Boiled bone plates, thin strips from the scapula of an ox, or autogenous bone grafts from the ribs, scapula or tibia have been used. The costal cartilages, as suggested by Morestin, and various sliding flap operations such as those of Koenig-Muller and Hacker-Durante have been employed. The introduction of foreign material, whether metal or bone, was finally abandoned in favor of the autogenous graft, whether of cartilage or bone from a rib, or of bone from tibia or skull.

Costal cartilage grafts have these objections. The protection they afford is not as secure as that of bone, they do not conform accurately to the contour of the skull; they act sometimes as foreign bodies and have to be removed. Whole ribs or sections of tibia are open to the objection

¹ *Riforma Medica*, June 11, 1921, 37. 24.

that it is difficult to make the graft fit accurately to the margins of the defect and grafts of rib or tibia have not the concavo-convexity necessary to conform to the contour of the skull. Ballin¹ outlines his technic for the repair of such defects in which he employs the outer half of a rib. The sketches accompanying his article show a simple rectangular defect, easily closed in this way; but most defects are not as regular as his drawings suggest and cannot be closed by this method. An irregular opening may be squared up but this increases the size of the defect. The thickness of his graft permits it to conform to the contour of the skull, but the incision necessary for the removal of the rib often causes the patient more discomfort than the wound of the head. If the dura is damaged Ballin replaces it with a fascial graft, advantageously taken from the under side of the scalp muscles. I do not approve as a routine practise of the insertion of a fascial covering in the bony defect superimposed upon the dura as suggested by Ballin and by Koenneche.² This fascial graft eventually becomes converted into scar tissue and the less of this about the cortex, the better.

We have not departed from the technic employed long before the war of using as the graft the outer table of the skull, cut to fit accurately the margins of the defect. Thus accurate approximation of the graft and margins of the defect, so essential for successful closure, is assured. The graft from the outer table is slightly concavo-convex and thus conforms well to the general contour of the skull. This technic, outlined in previous articles in *PROGRESSIVE MEDICINE*, has stood the test of time and has proved more acceptable than any of the war bred methods. Patients with cranial defects present an interesting and quite definite syndrome. Headaches, at times continuous and exhausting, with emotional changes perversions and depression, vertigo, nausea and a sense of insecurity make up the usual picture. Sudden movements, vibrations or bright flickering lights cannot be tolerated; epilepsy develops within three to six months in 10 to 15 per cent. With the signal exception of epilepsy, a cranioplasty often promises a fair measure of relief and, if practised at all, should be performed without undue delay, that is before the onset of epilepsy or before the patient has become the victim of a traumatic neurosis. If the original wound was infected, the operation should be postponed until six months have elapsed from the time of complete wound repair.

TRAUMATIC PNEUMOCRANIUM. How often this condition complicates a fractured skull is a matter of conjecture. Unquestionably it is rare, though one cannot help but wonder whether more frequent and thorough *x-ray* studies might not reveal more cases than we were wont to believe. Pneumocranium follows a fracture into the accessory nasal sinuses, usually the frontal sinus, which permits of entrance of air into the cranial chamber. Laceration of the dura, acting as a flap valve, allows the air to enter but not to escape.

This condition is only discovered accidentally in the *x-ray* examina-

¹ Surgery, Gynecology and Obstetrics, July, 1921.

² Deutsch. Zeitschrift f. Chirurgie, May, 1921, 162, 5, 6.

tion. In Doyle's¹ case the patient had been injured some three months previously, sustaining severe lacerations of his scalp in the supraorbital region with unconsciousness lasting several days. When he regained consciousness he complained of constant severe headache in the left frontal region and blindness in the left eye. A month after his injury he was extremely irritable, complained of vertigo, and fainted three or four times a day. Three weeks later he developed an auditory aphasia and loss of memory. On admission to the hospital the x-ray plates were taken and revealed an area of decreased density in the frontal region on the left side about $3\frac{1}{2} \times 2\frac{1}{2} \times 2\frac{1}{4}$ inches in extent. (See Figs. 6 to 9.) At operation, the dura was found to be tense and under pressure. On opening it, the air escaped with an audible hiss. The frontal lobe was compressed by the air and markedly softened. There was evidence of hemorrhage. The patient died the following day.



FIG. 6.—Lateral view of the left side of head, showing air in cranial cavity displacing anterior portion of left hemisphere. The lines of the depressed fracture in the left frontal and temporal region are also shown extending down to the base. Note that the fracture does not show well through the air cavity, because of the overexposure in this area. (Doyle.)

The following conditions were observed at autopsy: There were two wounds of the dura and a depressed fracture above the outer half of the orbit extending toward the temporal region in one direction and toward the cribriform plate of the ethmoid in the other. The brain tissue in the affected area was soft and did not expand after the air pressure had been released. Brain tissue was adherent over the frontal sinus, but no opening directly into the frontal sinus was found. The dura was adherent to the skull in many places and the air was under the dura. The fracture extended into the ethmoid sinuses; a probe passed into the sinus found a free passage into the left nasal cavity. Considerable thick

¹ American Journal of Roentgenology, No. 2, vol. 3, pp. 73-75.

mucus was found in the passage through which the probe passed. This probably acted as a valve in admitting and confining the air.



FIG. 7.—Lateral view of right side. There is no difference in size of the cavity, as it extends to the mid-line of the skull. (Doyle.)



FIG. 8.—Postero-anterior view, plate anterior, showing the lateral dimensions of the air cavity. (Doyle.)

In the case reported by Horrax¹ the patient suffered a severe compound comminuted and depressed fracture in the left frontal region.

¹ *Annals of Surgery*, January, 1921.

Operation, with suitable débridement of the wound, was performed at once. X-ray plates taken a month after the accident showed the cranial defect and also underlying the bony defect a lobulated shadow of decreased density which looked like a conglomerate mass of bubbles, the fracture being such as to leave no doubt but that this irregular area represented an accumulation of air within the cranium. Its extension backward within the cerebral tissue of the left frontal lobe for a considerable distance was shown by the lateral plate. The source of this gaseous matter—presumably air—was unquestionably from a crack involving the frontal sinus, as a second *x*-ray taken two months after the first showed the bony defect but no area of decreased density below it. The air was thought to have been absorbed.



FIG. 9.—Antero-posterior view, plate posterior, showing limitation to left hemisphere. (Doyle.)

An acute pneumocranium should be regarded as an indication for immediate operation both to remove the air and to close the sinus. In chronic cases, when the air has been present for some time and is not causing symptoms, it should be left alone, as it will be absorbed. Careful *x*-ray studies should be made to determine whether the amount of air is increasing. If it is increasing, one must assume that the sinus is still open and an operation should be performed for its closure. The great danger in these cases, of course, is an infection of the meninges from the nasal sinuses.

THE SALIVARY GLANDS.

Fistulæ of Stenson's Duct. For several years I have followed the literature on this subject and have presented different procedures for

its treatment. Chubb¹ states that the number and varied character of these methods and the drastic nature of some of them is a sufficient indication of their uncertain value. He reports a method which he has practised in 3 cases, in all of which he succeeded in obtaining a free and normal discharge of the parotid secretion into the mouth. Two horizontal incisions, about one-quarter of an inch apart, are made, the one



FIG. 10.—Showing the incisions. A probe has been inserted into the fistula. The triangular areas of skin on either side of the area bearing the opening are discarded. (Chubb.)

above and the other below the fistula. Two short vertical incisions serve to isolate a small button of skin baring the fistulous opening. The posterior of these incisions is cautiously deepened, a probe being placed in the duct to prevent its injury (see Figs. 10, 11 and 12). The anterior vertical incision is deepened at once until it enters the mouth immediately below the reflection of the mucous membrane opposite the upper molar teeth. The probe is withdrawn and, by means of catgut mattress sutures inserted in the anterior and posterior lips of the skin button, this is drawn through the wound into the mouth. Similar mattress sutures are inserted in the lips of the opening of the buccal

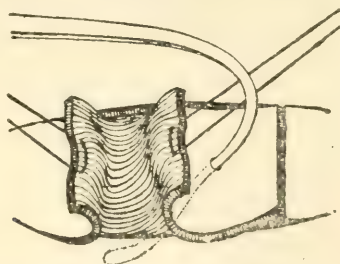


FIG. 11.—The island of skin bearing the fistulous opening in course of mobilization. Deepening the posterior incision, with probe in position in the duct. (Chubb.)

mucous membrane, and these are now tied together within the mouth. The original anterior edge of the skin button is stitched to the posterior lip of the opening in the mucous membrane while the posterior edge of the latter is tied to the anterior lip. No attempt is made to mobilize the skin button sufficiently to allow its complete reversion. The lips

¹ British Medical Journal, 1921, 1, 45.

of the original incision are slightly undercut and brought together, thus covering the reverse surface of the skin button bearing the fistulous opening.

An excellent review of the literature on this subject is presented by Hupp.¹ He reports a case suffering from carcinoma of the cheek in which it was necessary to consider the question of side-tracking the secretion of the parotid gland. After removal of the growth there was left a short stump of the duct, precluding the possibility of following any of the operations suggested for diverting the flow of saliva into the mouth. Ligation of the duct with the chances of leakage, infection or cyst formation, with the probable defeat of the plastic repair was not deemed wise. Accordingly, the remaining part of the duct was crushed with an angiotribe as far back as possible and this short ribbon was

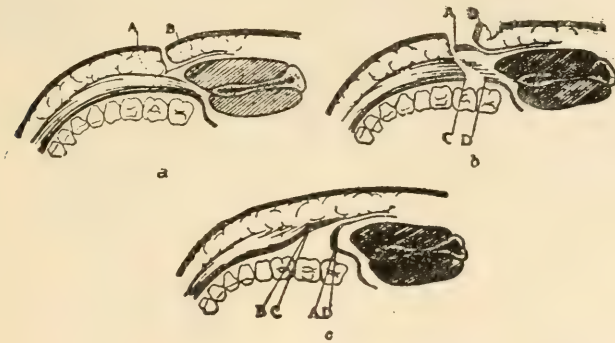


FIG. 12.—Semi-diagrammatic horizontal sections showing: *a*, The condition of duct and fistula prior to operation; A and B position of incisions. *b*, The mobilized area of skin bearing the fistulous opening, and containing the salivary duct in its pedicle; A and B, anterior and posterior lips of mobilized skin area; c and D, lips of the opening through the mucous membrane. *c*, The mobilized skin area seen in *b* has been inverted, and its edges sewn to those of the opening in the mucous membrane. The letters A, B, C, D have the same significance as in *b*. (Chubb.)

brought through a stab incision in the posterior flap on to the cheek and sutured to the skin. The wound healed without interruption, there was at no time any further discharge of saliva from the obliterated duct, and there was an absence of any phenomena of retention or painful tension on the part of the gland. His paper is accompanied not only by an abstract of most the articles on this subject, but also by an excellent bibliography.

Salivary Calculi. Calculi in the salivary glands are not so commonly observed as to lead to immediate diagnosis in the majority of cases. If in the parotid, unilateral mumps may be simulated and if in the sublingual gland, ranula may be suspected because of the resulting cyst formation. The x-ray is the most important means of affording diagnostic proofs. Chapman² advocates the use of hollow exploring needles to reduce the sacrifice of tissues to the minimum. He believes that the

¹ *Annals of Surgery*, 1921, **74**, 331.

² *Rhode Island Medical Journal*, 1921, **4**, 110.

intra-oral operation should be performed whenever possible, and suggests the use of various eye instruments, such as Bowman's probe for dilating and exploring, Agnew's or Noyes' canaliculous knives for slitting the meatus or ducts, and iris forceps for grasping the stone. Hopkins¹ states that through the Surgeon-General's Library, he has obtained records of only 20 cases of calculus in the submaxillary gland itself. The majority of these were at first wrongly diagnosed, the most frequent error is to accuse the teeth, and many have been extracted for supposed alveolar abscess before the real nature of the trouble was identified. The intermittent character of the pain, induced by food, and the enlarged tender submaxillary gland and x-ray examination should establish the diagnosis. Chapman states that when the stone is embedded in the gland and the area is sterile or the infection slight, there may be proliferation of connective tissue, a thickening of the gland capsule, and this together with the adenitis may lead to a tumor causing errors in diagnosis.

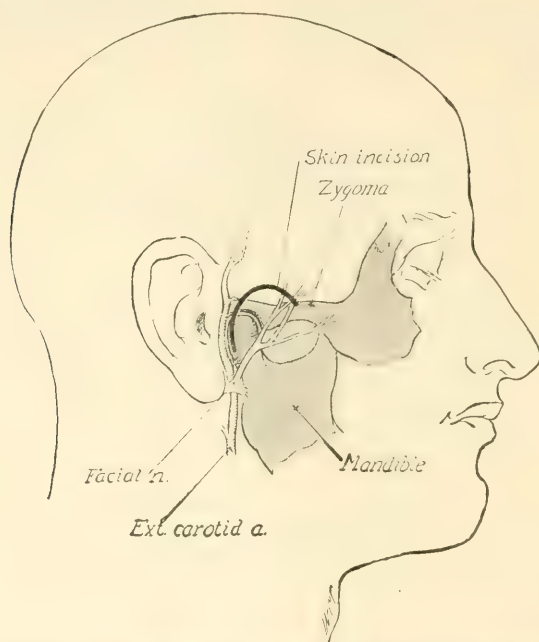


FIG. 13.—Showing the curved incision through the skin and superficial fat, with its relations to the zygoma, the superficial temporal artery, and the temporal branches of the facial nerve, as they cross the zygoma. (Neff.)

THE JAWS.

Ankylosis. The operation of *arthroplasty* has been discussed in these columns from time to time and lately the writings of Henderson, New and Chubb have been presented. A recent paper by Neff² takes up the anatomy and pathology of the mandibular joint and considers rather

¹ Boston Medical and Surgical Journal, 1921, 185, 378.

² Surgery, Gynecology and Obstetrics, 1921, 33, 8.

completely the causes and clinical aspects of ankylosis of the jaw. However, the part of the paper which seems most interesting is that

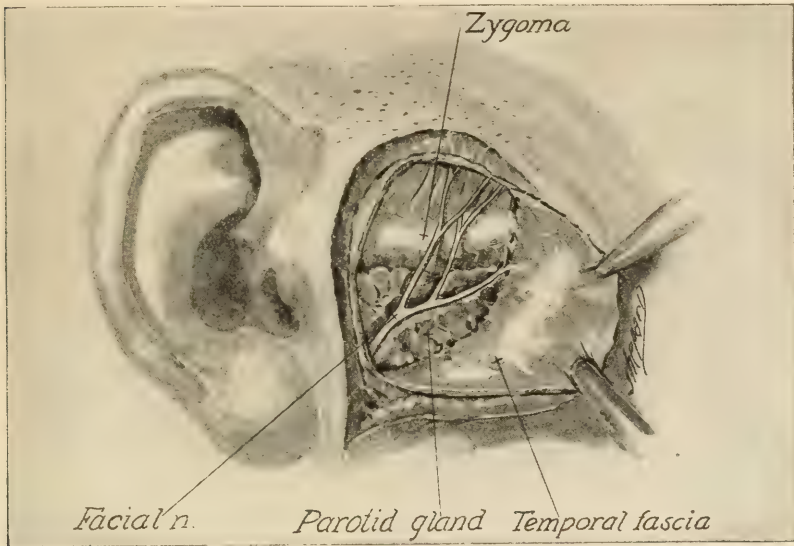


FIG. 14.—The temporal branches of the facial nerve as they cross the zygoma. The flaps of skin and temporal fascia have been dissected forward and retracted. (From a dissection.) (Neff.)

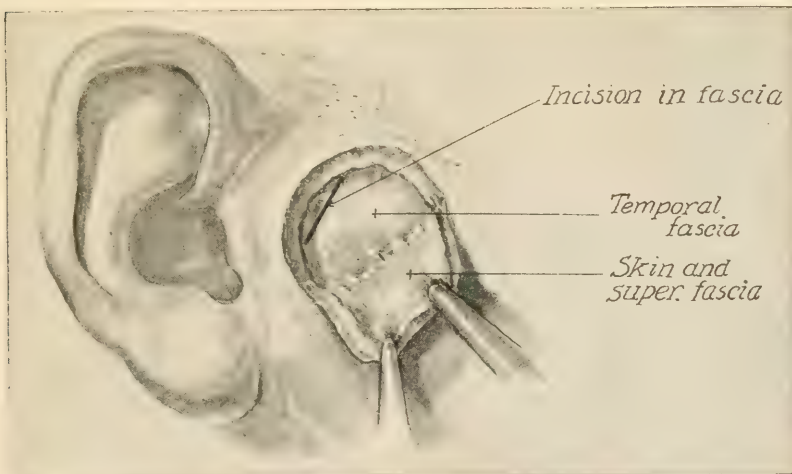


FIG. 15.—The curved incision has been made through the skin and superficial fat and the flap dissected downward and forward, exposing the temporal fascia. The black line shows the straight incision through the temporal fascia, upward and forward, over the zygoma and well posterior. This is to avoid the temporal branches of the facial nerve. (From a dissection.) (Neff.)

which pertains to technic. I am reproducing certain of his illustrations (Figs. 13, 14 and 15). He cautions against injury of the internal maxil-

lary artery which may cause very troublesome hemorrhage. It may be avoided if, after exposing the temporomandibular joint from above, one adheres closely to the bone in separating the soft tissues from the neck. Injury to the superficial temporal artery is not serious, as the vessel can be readily ligated if injured. Injury to the temporal branches of the facial nerve is much more serious and may be avoided by making the curved incision shown in the illustration. It begins an inch in front of the external meatus and curves backward over the upper border of the zygoma and downward for three-fourths of an inch in front of the ear. This flap of skin and superficial fat is retracted downward and forward. The zygoma is then exposed by another incision, three-fourths of an inch long, through the temporal fascia, well posterior and running upward and forward. The temporal fascia and the temporal branches of the facial nerve are now separated from the zygoma by means of a periosteotome and retracted in a direction forward and a little downward. About one-half inch of the zygoma is now resected, after which the condyle will be seen in the posterior portion of the wound. If bony ankylosis exists, the joint surfaces should be chiseled apart and the condyle with one-fourth inch of the neck, removed.

The best way to divide the bone in this situation, is with a straight bone-cutting forceps. The bone is not cut through with one bite, but is divided by a series of small bites, beginning at the side of the neck and going a little deeper with each successive bite. In this way no unnecessary traumatism is done and it is surprising how easily any bone may be divided in this manner. If the jaws open widely and freely after this, nothing more is necessary, except to control the hemorrhage and close the wound, with or without twenty-four-hour drainage.

Carr¹ reports the end-results of 6 cases operated on for bony ankylosis. All of the patients are highly pleased, and the results are very satisfactory. He advocates the method devised by Murphy as described by Kreuscher² and abstracted in these pages in 1917. His experience has taught that certain accidents are prone to occur and he records the methods of avoiding them. Injury to the temporal artery can be avoided by locating it by palpation and making the vertical incision just anterior to it. The horizontal arm of the incision may be made along the lower border of the zygoma, instead of the upper border, as recommended by Murphy, and still be above and parallel to the main temporal facial branches of the seventh nerve, and may be carried down to the bone with one sweep of the knife without cutting any important structures. A careful dissection should first be made, at the anterior end of the horizontal incision until the anterior border of the ramus can be felt and freed sufficiently to get a Murphy retractor under it. In his first 4 cases, the parotid gland was injured three times, with a salivary fistula as the result. Although these fistulæ all healed spontaneously in from three to eight weeks, they were annoying. This accident may be avoided by following the above modifications and the subsequent dissection made by lifting up all tissue over the bone, *en*

¹ *Annals of Surgery*, 1921, **33**, 314.

² *Interstate Medical Journal*, 1916, **23**, 857.

masse, keeping close against the periosteum until the posterior border of the ramus is reached, the only incision through these tissues being a deepening of the original skin incision over the lower border of the zygoma and well above any important structure. The second Murphy retractor is then inserted under the posterior edge of the ramus until it meets the first one behind the center of the bone. He then bores the bone with a chain of holes, with a cranial drill, connects them with a gouge chisel, and removes the bone with the chisel without hammering, which he strongly opposes. He does not favor the interposition of any extraneous substances between the divided bone. The greatest danger of recurrence is from callous formation becoming attached to the ramus and zygoma and reuniting them. This is avoided by cutting out sufficient bone anteriorly.

UNILATERAL SUBLUXATION. RECURRENT SNAPPING JAW. In 1919, I presented an abstract of Blake's paper in which he dwelt on the difficulties of operation on the joint and proposed an operation which would lace or bridle the coronoid process to the zygomatic arch. Again, in 1920, I commented on the paper by Pringle, in which he described a method of reduction by hard pressure at the back of the condyle with the mouth open followed by closure of the jaw. Ashhurst¹ believes that Blake places undue emphasis on the difficulties and dangers of operation on the joint itself. He believes that whatever the cause of this deformity may be, it is evident that the cartilage is at fault, and that the simplest and most certain method of affecting a cure consists in removing the cartilage from the condyle. The technic was as follows: An incision 2 cm. long was made over the zygoma, back to the auricle, and then downward for 3 cm. in front of the auricle. The masseter muscle was detached subperiosteally and the small triangular flap of skin and muscle turned down. The cartilage, which was loosely attached, was caught in a tenaculum and excised with the scissors. The incision was closed in layers without drainage. Seven months later the patient was examined and found to be cured.

THE FACE AND MOUTH.

Lipoma of the Cheek. LIPOMAS OF THE CORPUS ADIPOSUM BUCCÆ. According to Cameron,² these are unusual, and a thorough search of the literature shows that probably 15 cases have been reported. Cameron give a brief but adequate report of these, beginning with that of Auvert, in 1848, and adds an additional case of his own. He quotes from the paper of Scammon³ who published an exhaustive article on the development of the sucking pad and described it as "a specialized and sharply circumscribed mass of adipose tissue which lies in the cheek partially wedged between the masseter and buccinator muscles, and covered externally by the superficial fascia of the face and the zygomatic muscle. Posteriorly, it is connected by a stalk with a much larger fat mass,

¹ Annals of Surgery, 1921, **73**, 712.

² Journal of the American Medical Association, 1921, **76**, 778.

³ Anatomical Record, 1919, **15**, 267.

termed by Forster the corpus adiposum maxillæ, which is located between the temporal and the pterygoid muscles, and which possesses a superficial process extending over the outer surface of the temporal muscle beneath the temporal fascia." Scammon examined 42 cadavers and found the structure well developed in 34, and in 2 well developed on one side and practically absent on the other.

Rhinophima. Last year, I quoted the excellent paper by Seelig, and in 1920 the subject was also presented. Seelig, Gibbon, and Fuld all advocated surgical excision. Grattan, in addition, applied trichloroacetic acid. This year, I note a paper by Clark¹ who advocates the desiccation method. It will be remembered that this method consists of the devitalization of neoplastic tissue by the utilization of heat by just sufficient intensity to desiccate the tissues. This heat is produced by a monopolar high-frequency current of the Oudin type. The method is as follows: After expressing the sebaceous material as thoroughly as possible, the nose is painted with tincture of iodine and the involved area infiltrated with a 2 per cent solution of novocaine and adrenalin injected through a very fine and very sharp needle. The hypertrophic area is desiccated as deeply as is necessary, frequently almost to the cartilage. The needle may be inserted into the tissue beneath the surface while the current is passing. There is no smoke or odor of burning flesh during the operation. After thorough desiccation is accomplished, a sharp scalpel or razor is employed to pare off the desiccated tissue until the nose is restored to its proper size and shape. In a few days a superficial slough separates and a sterile ulcer results. The wound is dressed daily, cleansed with peroxide of hydrogen, dried, and painted with dichloramine-T, covered with paraffin mesh gauze and this in turn covered with lint annointed with boric ointment. In from three to five weeks, complete healing takes place, with a good cosmetic result.

Furuncle of the Lip. It is a surgical tradition that furuncle or carbuncle of the lip is a very dangerous lesion and may easily lead to death. The rich, lymphatic distribution and the connection of the facial and ophthalmic veins are the anatomical reasons for the seriousness of this condition. Lanz² reports a number of cases and states that if incision is necessary the necrotic center of the furuncle should be treated with the thermocautery without pressure. Warm compresses should be continuously applied.

Retropharyngeal Abscess. In 1919, I reviewed this subject and presented a full abstract of Rush's and Schiller's papers. This year we have a paper by Frank³ whose experience includes nearly 100 cases. The paper is very complete and as it was read before a meeting of the Association is accompanied by a discussion. As the paper is easily accessible, it is not necessary to present an abstract in full, and his method of treatment will be the only portion presented. The child is wrapped in a sheet or blanket, with the arms at the side of the body and legs extended, and laid flat on the table, with the head turned toward the

¹ Urological and Cutaneous Review, 1921, vol. 25.

² Abstract in Surgery, Gynecology and Obstetrics, 1921, 33, 14.

³ Journal of the American Medical Association, 1921, 77, 577.

operator. The moment the abscess is opened, the child is turned quickly on its stomach, with the body elevated somewhat above the level of the head, in order to diminish the likelihood of pus being aspirated into the trachea. The operation consists in inserting the index finger of the left hand into the child's mouth, using a gag in older children, to locate fluctuation or the most pronounced area of pointing. With the finger maintained in this position, an artery snap, without teeth somewhat curved and moderately pointed, is introduced closed into the mouth, along the inserted finger and is directed by the latter to the point of election. The hemostat is pushed quickly into the body of the abscess and withdrawn with the blades widely open.

Carcinoma of the Face and Mouth. The technical procedures involved in the treatment of malignant disease of the mouth are undergoing considerable modification and change at the present time by reason of the increasing use of radium and *x*-rays. I am not ready to present a critical review of this subject and feel that it should be postponed for another year at least. We will content ourselves for the present with presenting an abstract of a few of the important papers bearing on this subject.

CARCINOMA OF THE NOSE. Sutton¹ agrees with Broders in finding a rather high percentage of involvement of this organ. Consideration of the predisposing etiological factors showed that long-continued and repeated sunburn, with or without the ensuing development of seborrheic keratosis, was undoubtedly the most common. Of the 50 patients whose cases were selected for this particular report, 36 had spent all, or nearly all, of their lives on farms or ranches. In regard to treatment, Sutton advises destruction of the prickle-cell variety by the knife cautery followed by radium or the roentgen ray (employing a Coolidge tube and exact dosage). Treatment should be thorough and not half-hearted. On the other hand, in the milder type, or Krompecher's carcinoma, curettage, immediately followed by the application of liquor hydrargyri nitratis, neutralized three minutes afterward with sodium bicarbonate, with subsequent radium therapy, is satisfactory and dependable. He has found repeated short exposures of *x*-rays, if these are used, to give better cosmetic results than single heavy ones. In those cases presenting cartilage involvement, excision is preferable to radial therapy.

CARCINOMA OF THE LIP. A study of 136 cases is reported by Sistrunk² of the Mayo Clinic, and were divided into three groups: Group 1 comprises 98 cases, in which a primary complete operation was performed, when the glands were not involved; that is, a local excision of the growth with removal of the glands draining the lower lip; 90.3 per cent of these patients were alive from five to eight years after operation. In 11 of these, local recurrences occurred, and in 3 recurrences occurred in the glands, which were subsequently removed; 2 of these probably have a recurrence at the present time. Group 2 comprised 11 cases, in which the glands were involved at the time of operation. Only 2 (18.1 per cent) are alive five to eight years after operation. One local recurrence and 3 recurrences in the neck occurred. Group 3 comprised 27

¹ Journal of the American Medical Association, 1921, **77**, 1567.

² Annals of Surgery, 1921, **73**, 521.

cases in which the growth only was excised, usually on account of the age or physical condition of the patient; 79.2 per cent of these are alive from five to eight years later; 7 had recurrences of the growth which were subsequently removed and one of these probably has a recurrence at the present time. Sistrunk remarks that the percentage of local recurrences seems too large and that this probably could be avoided to a certain extent by a wider removal of the growth, and the use of radium after operation.

I am sorry to see that Sistrunk advocates excision of the growth by a V-incision. Long ago, this incision was shown to be followed by a high percentage of local recurrence. On the other hand, I wish to commend the final paragraph in his paper, particularly in view of the present exaggerated enthusiasm for radium. "Treatment of the growth by means of radium and the *x*-ray without removal of the glands does not seem a radical procedure. We have seen a number of patients with an extension of the malignancy later into the glands while the primary lesion remained cured. There is no doubt that radium often destroys the growth, but such a procedure is almost identical with the methods in which the growth is removed with pastes or by local excisions. We know from experience that although there may be no local recurrence of the growth following the latter procedures, in about from 20 per cent to 30 per cent of the cases, metastasis occurs later in the submaxillary and submental glands."

CARCINOMA OF THE TONGUE. Bloodgood¹ presents a study of 265 lesions of the tongue in men and 33 in women. I am unable to determine whether these were his personal operated cases or whether they constituted the group of which he has specimens in his laboratory. He says that a study of the ultimate results shows that after five years, 62 per cent of the patients with early malignant cancer are well, and 12 per cent of those with advanced cancer, while all those with hopeless and inoperable cancer are dead.

Reference was made in the opening paragraph of this section to the fact that technical procedures were changing and shifting at the present times. A few years ago, we were concerned with the radical procedures for the removal of the tongue, with the method of Kocker, Whitehead, Butlin, Bastianelli, and others. Today, we are confronted with the question as to whether it is necessary to excise the tongue at all. Quick² states that, in his opinion, "the primary lesion in cancer of the tongue should be managed entirely by the use of radium." The cervical nodes should be treated conservatively by external radiation, followed by a complete neck dissection under local anesthesia, coupled with the use of radium emanation buried throughout the wound. He feels convinced that this form of treatment in unselected cases will yield a higher percentage of clinical cures than will surgery alone, in the selected operable group.

Quick quotes certain well-known surgical statistics, showing the results after a period of years, for instance, Bastinelli, 11.6 per cent;

¹ Journal of the American Medical Association, 1921, **77**, 1381.

² Annals of Surgery, 1921, **73**, 716.

Butlin, 27.8 per cent; Capetti, 18 per cent; Cobb and Simmons, 14.3 per cent. It appears from Quick's paper, that during the past three and a half years they have treated at the Memorial Hospital, New York, 148 cases of cancer of the tongue, of which 128 were primary cases with or without enlargement of the lymph nodes. Of these cases, 61 or 41 per cent show complete retrogression, and 19 cases or 12.8 per cent still improving but not as yet free from disease. The remainder are dead, dying or lost track of.

In another paper, read before the American Medical Association in Boston, Quick¹ takes up more fully the conservative treatment of the cervical lymphatics in carcinoma of the mouth. He first considers the high operative mortality following an extreme radical operation with dissection of the neck on both sides. He quotes from Jamieson and Dobson² as to the necessity for a complete unilateral or bilateral block dissection of the neck depending upon the location and extent of the growth. He then considers the reports of Bloodgood and Broders, especially the latter, in which about 75 per cent of the cases of cancer of the lip with dissection of the glands have no demonstrable cells in the latter; in other words, the neck dissection was unnecessary. On the other hand, Bastianelli did not have a single patient with cancer of the base of the tongue well after three years, even though a radical bilateral operation on the neck had been performed. Quick, on this evidence, observes that "the blanket rule for block dissection of the neck is to be applied to every case that can stand it or will permit it, an appalling number of necessary operations must be undertaken, many of them offering but a poor chance for the patient at that." Much other matter is contained in this paper which is easily accessible and a very important one. Quick states that Ewing has noted that embolic cancer cells may be destroyed in the node under some circumstances, but that for the most part the nodes appear to retain and retard growth rather than destroy these cells. Evidence of retardation of growth in the nodes by fibrosis and encapsulation are common. In the discussion on this paper, Greenough made the important point that "if we incapacitate a lymph node by fibrosis, it is of no more use to the individual than if we took it out and I cannot see why the barrier produced by operation should not be as good a barrier as is a lymph node containing cancer and surrounded by fibrosis." Bloodgood, in the same discussion, stated that he could find no evidence that roentgen ray or radium alone can compete with surgery. Blair believed it dangerous for the section on surgery to advocate the non-dissection of the lymph nodes. Let us rest the argument at this point for this year.

Sarcoma of the Lip. This rare condition is naturally hard to diagnose and according to Sweitzer and Michelson³ nothing has been written on it since the paper by Markley⁴ in 1913. They report a case on the upper lip which resembled at first a phlegmon and was treated with crucial incision and

¹ Journal of the American Medical Association, 1921, **77**, 436.

² British Journal of Surgery, 1920, **8**, 80.

³ Journal of the American Medical Association, 1921, **77**, 1563.

⁴ Ibid., 1913, **61**, 334.

curettage of the infiltrated areas. A small piece of the lip was examined and the diagnosis of round cell carcinoma made. The entire lip was then excised, followed by x-ray treatment. Regional and internal metastasis followed and the patient died two months from the time of operation.

Hare-lip and Cleft Palate. Some time has elapsed since any extended review of this subject has been attempted in these columns. As a number of articles of importance have appeared during the past year, all of which take up most of the moot points, it would be of interest to discuss the subject from the standpoint of these writers without laying any stress on the opinions of, let us say, Berry, Brophy, Lane, and others. A very good review has been written by Ritchie¹, who discusses the opinions of most of the authorities. In another paper, Ritchie² suggests "that the critical situation in every case of congenital cleft of the lip and palate affecting the surgical repair is the condition of the alveolar process. If the baby is born with the process normally closed, no matter what the extent of the defect anteriorly or posteriorly, the principals of the operation are pretty well established and the technical measures comparatively simple. If the baby is born with the process open, unilaterally or bilaterally, then the problems are greatly increased and the series of surgical steps becomes involved." He apparently favors the grouping of Sherman (quoted by Ritchie) into (1) prealveolar cleft; (2) postalveolar cleft; (3) unilateral alveolar cleft; and (4) bilateral alveolar cleft. This grouping is valuable because (a) the groups correlate all combination with the embryological facts; (b) they separate the combinations according to their special surgical requirements; and (c) they indicate directly the paramount surgical condition, the condition of the alveolar process.

Thompson³ has a more complicated classification. Type I, complete unilateral cleft of the lip, unilateral cleft of the alveolar border, and complete cleft of the palate. Type II, complete bilateral cleft of the lip, bilateral cleft of the alveolar border, and complete cleft of the palate. Type III, intact lip, intact alveolar border, and complete cleft of the palate.

AGE FOR OPERATION. As Ritchie well says, it is difficult to quote opinions in regard to age without considering that most debated question of all, the sequence of operation. Moorehead⁴ believes that operation should be undertaken at the earliest age consistent with the child's physical conditions, in normal cases of development, this is from six to ten weeks after birth. I take it that he means closure of the hare-lip because later he states that he prefers to "wait until the twelfth or fifteenth month" and then goes on to discuss closure of the palate. In the discussion on this paper, Blair⁵ states that he prefers to operate during the first twenty-four hours of life and that shock at this age is practically impossible. Thompson has operated on the lip and alveolar border as soon after birth as possible, postponing the operation on the

¹ Archives of Surgery, 1921, **3**, 230.

² Minnesota Medicine, 1921, **4**, 15.

³ Annals of Surgery, 1921, **74**, 394.

⁴ Journal of the American Medical Association, 1921, **77**, 1951.

⁵ Ibid., p. 1953.

palate to about the age of six months. As he now prefers to operate on the alveolar border and anterior part of the palate first, I suppose he postpones all operating until that time. Ritchie advises operation as early as possible in prealveolar defects (hare-lip) and postponement of operation in postalveolar clefts to some time before the first year ("fifteen pounds old").

This brings up the point of the closure of the alveolar defect. It is not necessary to quote the well-known views of Brophy or other advocates of forcible compression at an early age. As Ritchie well says "there can be no debate as to the efficiency of forcible compression," but that it should be reserved for those patients with a wide cleft or in the delayed case in which, in the judgment of the surgeon, active pressure is needed to render easier the following closure of the soft parts. Eastman¹ "does not think that anything is more sure than that the repair of a lip will pull back into alignment the displaced premaxillary bone or that repair of the lip will tend to correct inequalities and irregularities in the alveolar process." On the other hand, Thompson insists that correction of the bony deformity should precede every operation, because it is impossible to repair a lip that will satisfy critical inspection unless we have previously restored the curve of the alveolar border of the jaw, straightened the nasal septum, and refashioned the anterior nasal aperture. He believes that once the bony deformities are remedied the repair of the lip and nostril is a matter of detail. Brophy² says that "it has taken about thirty-five years to establish the practice of bone surgery first in the treatment of congenital cleft palate." But, Thompson does not agree with the impression given by Brophy that the edges of the cleft can be brought into contact by merely approximating the sides of the maxillæ except, first, in the rare cases where the palatal plates have retained the normal horizontal position, and second, in cases where the palatal plates have been thrust symmetrically apart. If forcible approximation was persisted in, it would result in serious disfigurement because the jaw would be narrowed to such a degree that a long, narrow beak would result. Both Thompson and Moorehead speak of molding the alveolar border and suturing and approximated edges by a wire or kangaroo tendon suture. Moorehead states that the bones are molded with a three fold purpose in view: (a) To close the bone cleft; (b) to restore proper relationship between upper and lower arches and (c) to bring the nose into the median line of the face.

Finally, we might quote from Ritchie the evidence in regard to age in the sequence of operation: "(1) In prealveolar cleft the earliest possible time compatible with the condition of the child; (2) in postalveolar cleft, before speech function is developed, but whenever technically possible to be done at 'fifteen pounds old'; (3) in unilateral alveolar cleft, first step to be used before the child is three months old and much earlier when indicated. The lip to be constructed first and the palate when the child is approximately one year old. Mechanical compression to be undertaken first in the selected case and not as a routine procedure;

¹ Journal of the American Medical Association, 1921, **77**, 1963.

² *Ibid.*, **77**, 1954.

(4) in bilateral alveolar cleft, same recommendations as in Group 3 except that the vomer should be carefully incised as a preliminary step." It also seems worth while to reproduce the following table from Thompson because it illustrates so graphically the points under discussion.

Operation.	First alternative.	Second alternative.	Third alternative.	Fourth alternative.
First . .	Lip and alveolar border	Lip, alveolar border and anterior part of palate	Alveolar border and anterior part of palate	Alveolar border.
Second . .	Palate; complete at one sitting (rare) or anterior part only	Palate; posterior part	Lip	Lip.
Third . .	Palate; posterior part	Palate; posterior part	Palate; complete at once (rare) or anterior part only.
Fourth	Palate; posterior part.

In connection with the above table, Thompson states that in his earlier work, he "followed the operative sequence given in the 'first alternative' and found that the results were very satisfactory. There was, however, one serious objection. In the second operation it was very difficult to repair the extreme anterior end of the cleft in the hard palate, and as a result a small opening persisted that was very hard to close. This led us to try the 'second alternative,' in which we were ambitious enough to try to repair the alveolar border, the anterior part of the hard palate and the lip in one sitting. We found that the results were satisfactory and that the palate could be closed subsequently in one operation. Unfortunately, the operation was followed by severe shock and was unsafe unless the baby was unusually well nourished and robust. This led us to employ the 'third alternative,' in which alveolar border and anterior part of the palate were repaired at the first operation and the lip and posterior part of the palate at later and separate operations. As our experience grows we are gradually adopting this procedure as the one of choice, reserving the first alternative to those cases where we wish to gratify the desire of the parents to have the lip closed as soon as possible. The 'fourth alternative' is rarely employed in unilateral clefts of the alveolar border. It is reserved almost exclusively for bilateral clefts of Type II."

Certain points in regard to *technic* are brought out by these writers. Ritchie well says "that those incisions of the lip which require diagrams are complicated and few of us have surgical accumen sufficient to select the proper angles for individual cases." For some time, we have been practising the operation advised by Thompson¹ in 1912. The descrip-

¹ Surgery, Gynecology and Obstetrics, 1912, 14, 494.

tion of this operation is repeated in the article now under discussion. As I do not want to quote the paper in its entirety, the reader is referred to the original article for a full description. He takes particular care to attach the "hump" forming the corner between the cleft and the nostril margin to the side of the columella in such a way as to carry the ala nasi medially and upward. I notice that Eastman recommends silver wire to draw the alæ into position, because it is not only aseptic and antiseptic but also activates cell growth. Brown¹ draws attention to the necessity of suturing very accurately the fissure along the floor of the nose. He states that not infrequently the intranasal sutures should be placed at a subsequent operation after the lip wound has closed and when the final adjustment of the parts will favor greater accuracy than is practicable when the lip fissure is first closed. It must be well understood, however, that a poorly shaped nostril will result unless the alveolar border closes or is closed.

Moorehead says that the low, flat, broad nostril following operation is caused by several factors: (1) Incomplete reduction of the long segment; (2) depression of the short segment; (3) incomplete or imperfect preparation of soft tissues in shaping the nose and lip; (4) use of a nipple following the operation; (5) sucking of the thumb or finger or the use of a "pacifier."

I notice that Ritchie mentions, as one of the requirements in the lip repair, a long lip, but Brown well states that under no circumstances should the lip be made too long, particularly as the defect has a tendency to increase as time goes on, and its symmetrical shortening becomes a matter of considerable difficulty in many cases. The method of Thompson will be found of infinite value in determining the proper length to make the lip, particularly if sufficient undercutting is done to allow free mobility of the tissues. This latter point is brought out by Moorehead in his illustrations. Thompson's method consists simply of determining the exact depth of the lip required by measuring with screw compasses with sharp points directly downward on the sound side from the lower margin of the nostril to the mucocutaneous margin. By then measuring the same distance from the "hump" or projection (or suture) previously fixed at the margin of the nostril, to the mucocutaneous junction on either side of the cleft, the exact length of the lateral incisions is ascertained, which, when pared and brought together, will give the lip the proper depth. The width of the vermilion border of the lip is ascertained by the same method, *i. e.*, the use of compasses. In double hare-lip, the philtrum must be taken into account and is used to form the upper medial portion only of the new lip. A valuable section of Brown's paper is that describing the correction of the lip which has been made too long. He finds that his best results have been secured by the excision of tissue just above the prolabial border so that no perceptible scar will be apparent, because the line of union will be where there is always a distinctive demarcation at the junction of skin and mucous membrane. The incision is made to slant obliquely from the skin sur-

¹ Journal of the American Medical Association, 1921, **77**, 1954.

face downward toward the mucous membrane in order to thicken the lip as the prolabium is drawn up over the deeper tissues where approximation is accomplished. The natural outward roll is thus restored. After several months an additional correction can be made in the same manner and still greater perfection secured. In this way, by cautious procedure, the danger of unevenness or cutting away too much may be avoided and a satisfactory labial expression secured.

The repair of the palate occupies much more attention in the literature and about its treatment has been waged much of the controversy. I do not intend to go into this subject extensively, especially as the writers quoted have mostly written only of certain points in the technic. The one exception is Thompson who describes the repair of the palate *in extenso*. Reference to his table will show that he now prefers to repair the anterior part of the palate only at the first operation without inflicting any injury on the velum; because if the velum is rendered hard and cicatricial, the last stage of the operation on the soft palate will be made

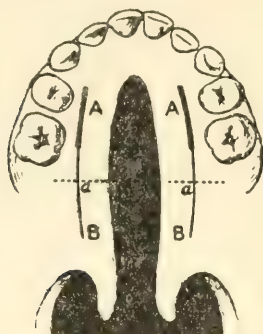


FIG. 16

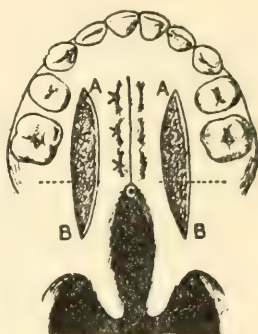


FIG. 17

FIGS. 16 and 17.—The dotted line represents the position of the posterior edge of the hard palate. (Kellock.)

very difficult, and primary union problematical. I believe that I can accurately state that he operates by the Langenbeck method up to the point of suture, when he follows Brophy's plan in using silver wire sutures and lead plates, to prevent tension. Sherman (quoted by Ritchie) closes the soft palate first to obtain lateral pressure, fore and aft, upon the anterior hard palate. Kellock¹ finds that the most common site of failure is at the junction of the hard and soft palates, which he believes is due to ischemia of the parts brought about by the lateral incisions (Langenbeck) that are made in order to bring the two halves of the palate together. He says that in the making of these incisions the posterior palatal artery or several of its principal branches must necessarily be divided. In the majority of cases, if properly performed, I do not think that this is so. Kellock advises a two stage-operation, with repair of the anterior palate first, to insure good circulation in the lateral portions of the soft palate before they are sutured together. The illustrations (Fig. 16 and 17) graphically portray his method. He

¹ British Journal of Surgery, 1921, 9, 290.

prolongs the original incisions, made after the usual method to free the flaps, backwards into the soft palate to B. B. Even if the halves of the soft palate are slack one should refrain from completing the operation in one stage. At the end of a week the second part of the operation can be done, the edges of the soft palate being freshened and sutured. I notice that both Ritchie and Kellock state that it is not necessary to pare the edges in all cases because a mattress suture will bring the posterior raw surfaces together leaving more or less of a ridge or frenum in the middle line. Ritchie does not use mattress sutures in the soft palate, suturing singly on the mouth side and extending around the uvula and up the nasal side. Moorehead warns against division of the nasal mucosa at the posterior border of the bony palate as the practice frequently leads to non-union. The tissues at this point should be split and not divided.

Brophy¹ says that the Langenbech incisions are unnecessary, lead plates, wire tension sutures, and horsehair coaptation sutures are sufficient to make a good palate. If the palate is raised back as far as the styloid process of the temporal bone and hamular process of the sphenoid bone, it will be redundant and when denuded from the hard palate will drop down and the edges meet without tension. Finally, Ritchie makes the significant statement that two improvements in his operating room equipment have greatly facilitated this work and have removed many of the dangers of operation. One is the bellows, long distance anesthesia, and the other is the aspiration outfit; one shortens the time of operation, the other helps respiration and minimizes postoperative pneumonia. Moorehead also advocates the aspirator as being superior to sponging, both in point of time and in irritation of the tissues. I must also once more call attention to Brown's paper in which much valuable information will be found regarding the treatment of unsightly results from previous operations.

I also find several other unusual points in papers treating of cleft palate. Thus, Gillies and Fry² advocate the "revolutionary principle of practicing operative closure of the soft palate only and closure of the hard palate by means of a dental plate." They state that the ideals to be aimed at are: Perfect speech, perfect mastication, normal nasal respiratory function, and insofar as a displaced maxilla causes deformity a normal bony contour. They believe that successful closure of a wide cleft by *any* of the present day operations is incompatible with the full attainment of the above ideals. The construction of the dental appliance is described by Fry. Aymard³ reports the successful practice of an operation based upon the principles of Esser. He worked upon the theory that the raw posterior surfaces after the Langenbech operation invite infection and therefore should be protected; he wrapped a plug or mask of a wax mixture with Thiersch graft and dropped them over the posterior raw surfaces.

¹ International Journal of Orthodontia and Oral Surgery, 1921, 7, 319.

² British Medical Journal, 1921, 1, 335.

³ Ibid., 2, 405.

Brophy¹ reports a case of "cleft palate extraordinary," with a cleft of the palate in the median line, with the premaxillary bones separated at the central suture and the palate cleft throughout the entire length. He operated on the patient and moved the bones together by introducing wire sutures above the hard palate which were tightened from time to time at intervals of about ten days. At the end of three months the edges of the cleft were practically in contact at which time the soft parts were sutured together. He states that the results in this case show the fallacy of the idea that one cannot bring the edges of the cleft together by wiring if the operation is done subsequent to the sixth month. Finally, I note that Coughlin² reports a case of reconstruction of the hard palate by means of a cartilage transplant. The method was that of the transference of a Gillies' tube containing a piece of implanted cartilage. Five steps were required to complete the operation and the result, two years later, was perfect, the bit of cartilage being firm in position and seeming to be just as large as it was when implanted. Those contemplating a similar operation should consult the original article.

THE NECK.

Ligation of the Common Carotid Artery. A number of interesting papers have appeared recently upon the dangers, accidents and precautions in ligation of this artery. Homan,³ Blair,⁴ Freeman,⁵ Moser,⁶ Perthes,⁷ Wieting,⁸ and Cauchoix⁹ being the principal contributors. It is generally accepted that ligation of this vessel is fraught with grave danger to the patient, cerebral complications developing in from 20 to 25 per cent according to most, although Cauchoix fixes the mortality at 11 per cent in pulsating exophthalmos because the collateral circulation is already partly established. He collected 18 cases of bilateral common carotid ligation and when both were ligated simultaneously death always resulted, when carried out at different stages the mortality was only 11 per cent, about the same as for single common ligation. Lenormant¹⁰ has published a paper with similar views. The higher mortality is due to the inclusion of the traumatic cases including operative wounds in the neck for cancer with ligation of the vessel. The best description of gunshot injuries to the common carotid will be found in Makin's book published in 1919.

Age is a factor of great importance and is mentioned by all the writers. Thus, Blair states that he has ligated the common carotid in 3 subjects who were over forty years of age with the deaths, whereas he has ligated the vessel 6 times in persons under thirty with only transient cerebral symptoms in 1 case. Freeman says that this predisposition is due to the increased bitterness of the internal coat due to arterio-

¹ Surgery, Gynecology and Obstetrics, 1921, **32**, 182.

² Journal of the American Medical Association, 1920, **75**, 1781.

³ Annals of Surgery, 1920, **71**, 707.

⁴ Ibid., p. 316.

⁵ Ibid., 1921, p. 313.

⁶ Zentralbl. f. Chir., 1921, p. 321.

⁷ Archiv. f. klin. Chir., 1920, **114**, 403.

⁸ Deutsch. Ztschr. f. Chir., 1921, **164**, 93.

⁹ Rev. de Chir., 1921, **40**, 197.

¹⁰ Presse Médicale, 1921, **29**, 485.

sclerosis which favor ruptures from ligation and thrombosis. Wieting remarks that the senile brain must be considered as an inferior one, not because of its sclerotic vessels but because of the poorer adaptability of the parenchymal cells in the white and gray matter.

The almost universally accepted cause of trouble is anemia, with softening of the brain from inadequate circulation due to defects in the circle of Willis. While not denying that such may be an occasional cause, Freeman prefers the explanation first offered by Zimmerman, in 1892, and also supported recently by Perthes which assumes that the ligation ruptures the inner coat, leading to the formation of a thrombus which may extend or may often give rise to emboli. That ligation does not always produce trouble is clear when one remembers that the furrow produced in the inner coat by the ligature is sometimes so smooth that coagulation fails to occur, and that emboli do not always become detached, even if a thrombus is present. Freeman speaks highly of Perthes' method: A strip of fascia lata, three or four inches long and half an inch wide, is obtained from the thigh, wrapped once or twice around the artery, tied in a half-knot, and the knot secured by a few sutures. It is pulled just tight enough to obliterate the vascular lumen without rupturing the internal coat. If desired, additional pressure and security against injury may be had by folding lengthwise another fascial strip several times upon itself and placing it between the knot and the artery. As is well known, fascia lata will not stretch or break easily, hence it makes an ideal material for the purpose.

As to the management of secondary hemorrhage from the branches of the common carotid artery we will simply quote from Blair: 1. That secondary hemorrhage of the carotid artery and its branches is to be prevented by not suturing wounds that extend through the floor of the mouth and by packing or freely draining all wounds in the neck, above the level of the thyroid cartilage, that contain a ligated primary branch of the carotid artery. (2) That secondary hemorrhage from a ligated primary branch might possibly be controlled by previously having placed the ligature as far from the carotid as possible and when bleeding actually occurs, (a) to free the stump from the surrounding indurated tissues, (b) to ligate any branches that are given off proximal to this ligature and, if necessary, to loosely religate the stump itself as far from its origin as possible.

If it is found necessary to place the ligature on the bleeding stump so close to the external carotid as to preclude the formation of a proximal clot, then the external carotid itself should be exposed and a ligature placed on each branch and on the trunk at least an inch from the bifurcation, in the hope of establishing a permanent clot in the external carotid itself. In this latter fashion I have successfully avoided ligating the external carotid dangerously close to its origin in a wound I knew would become infected.

Suture of the Common Carotid Artery. In connection with the above must be mentioned the unusual case reported by Sloan¹ in which, during

¹ Surgery, Gynecology and Obstetrics, 1921, 33, 62.

a dissection of the deeper planes of the neck in a case of carcinoma, he nicked the common carotid as it lay in a mass of scar tissue. "In the attempt to catch the supposed spurter, the carotid was caught with a hemostat which immediately cut through the sclerosed vessel walls. Before the bleeding was controlled by finger compression above and below the bleeding, the vessel wall was badly damaged by hemostats for about three-fourths of a centimeter, the damaged portion encroaching on about half of its circumference. He decided to excise the damaged area of the vessel and make an end-to-end anastomosis. About 8 mm. in length was excised and by the Carrel technic the suture was performed. On account of the proximity to the clavicle and the shortening of the bloodvessel, the most difficult part of the suturing was on the posterior aspect of the vessel between the first and third guy sutures. Moreover, the vessel wall was quite sclerosed, and had very little elasticity. The patient had a moderate degree of sclerosis of his large vessel and at the time of operation his blood-pressure was 156 mm. mercury systolic, and 100 mm. mercury diastolic. It was possible to peel off a ring from the cut end as one would uncurl the end of a coiled spring. In removing the distal carotid clamp when the suture line was finished, we found two places from which fine streams of blood spurted. A single stitch at each of these points made an absolutely tight suture line that allowed no leakage whatever. The suture line was further protected by pulling the deep fascia over it and stitching it in place. The dissection of the neck was then completed. The patient made an uninterrupted convalescence."

Goiter. The literature upon goiter assumed large proportions last year, as a glance at any of the indexes will show. I have read many of these papers and glanced over the majority and, generally speaking, I am of the opinion that most of it is "pot boiling" and partly for this reason and partly because our space has already been pretty well taken up we will only give a brief presentation this year. One of the most impressive of the papers of the year is that by Marine and Kimball¹ on the prevention of simple goiter in man. They say "if the prevention of goiter is good preventive medicine, it is better preventive surgery. With so simple, so rational and so cheap a means of prevention at our command, this human scourge which has taken its toll in misery, suffering and death throughout all ages, can and should be controlled if not eliminated." The results of their observations on school girls in Akron, Ohio, are as follows: Of 2190 pupils taking 2 gm. of sodium iodide twice yearly, only 5 have developed enlargement of the thyroid; while of 2305 pupils not taking the prophylactic, 495 have developed thyroid enlargement. Of 1182 pupils with thyroid enlargement at the first examination who took the prophylactic, 773 thyroids have decreased in size; while of 1048 pupils with thyroid enlargement at the first examination who did not take the prophylactic, 145 thyroids have decreased in size. Marine states that Klinger² reported even more striking curative results in the school children of the Zurich district. He

¹ Journal of the American Medical Association, 1921, **77**, 1068.

² Schweiz. med. Wchnschr., 1921, **51**, 12.

worked with school populations in which the incidence of goiter varied from 82 to 95 per cent, while our maximum incidence in Akron was 56 per cent. With such a high natural incidence of goiter, his observations necessarily deal more with the curative effects. Thus of 760 children, 90 per cent were goitrous at the first examination. After fifteen months' treatment with from 10 to 15 mg. of iodide weekly, only 28.3 per cent were goitrous, of a total of 643 children reexamined. I am sure that my readers will agree with me that this work of Marine's and of Klinger is far more important than any of the discussions pro and con about boiling water injections, ligation, etc.

TOXIC GOITER. We have not had a paper from British sources for some time. Berry¹ reports on a series of 500 goiter operations performed from January 1, 1913, to December 31, 1919. The article is very well illustrated and contains a number of analytical tables. One of these illustrates a peculiarity often seen in British writings, namely the separation of hospital from private cases. Of the 500 cases, 79 were considered "true exophthalmic," and of these, 3 died. In 2 out of the 3 cases the operation was performed wholly or mainly under local anesthesia, and Berry states that this may be noted by those who consider that the use of local anesthesia is the main factor of success in operations for exophthalmic goiter. In another place he says that he is using a light general anesthesia more and more in preference to local which is often very distressing to the patient. Evidence that physicians and surgeons are gradually getting on common ground in the therapeutics of this disease is apparent from the reports of a meeting of the Royal Society of Medicine of last year. Mackenzie² formerly a skeptic regarding surgical treatment now states that every patient unimproved within a reasonable time under medical treatment should have mentioned to her the possible benefits of surgery. On the other hand, Berry³ says that although his views regarding the value of operation have not changed substantially, yet he is rather less sanguine than previously owing to the great tendency to relapses even after operations most successfully performed. In the same discussion Berry stated that only 2 operations had any value—namely, thyroidectomy and ligation of the thyroid arteries. He has completely abandoned ligation of the inferior artery; it is a difficult operation, and of scarcely less danger than the removal of the whole lobe, which is far more likely to cure the disease. There are many other curious statements in this discussion which continues through several numbers of the *Journal*, but I will pass over them except that relating to the use of the *x*-rays which will be spoken of a little later.

It has been said that Berry is avoiding the use of local anesthesia but many surgeons are still partial to its use. Ochsner and Nuzum⁴ highly praise the advantages of nerve blocking in thyroidectomy. The post-operative convalescence being relatively free from thyrotoxicosis and the results very gratifying both to the surgeon and patient. The essential feature of his technic is the injection of the cervical plexus at the pos-

¹ *British Journal of Surgery*, 1921, **8**, 413.

² *British Medical Journal*, 1921, **1**, 268.

⁴ *Surgical Clinics of North America*, 1921, **1**, 981.

³ *Ibid.*

terior base of the sternocleidomastoid muscle and the parotid pockets above the superior thyroid vessel. Now Ochsner is a very skillful surgeon, but it is unwise to advocate this procedure in a popular journal without any reference to the possibility of harm, because Holm¹ reports a near fatality following paravertebral nerve blocking and has found several other cases on record of similar mishaps which in 2 were fatal. Holm ascribes the disturbances to the fact that some of the anesthetic is injected into the bloodvessel.

Criteria of Operability in Toxic Goiter. The surgeon who does not see many cases of toxic goiter will be well repaid by reading a paper by Cheever² who tries to clear away the fog that surrounds the decision as to when a case is operable or when operation is too dangerous. He quotes from Crile, Mason, Sistrunk, Lalvey, and others, showing that, with notable exceptions, recent writers have found it impossible to formulate any possible exact criteria of the ability of the patient to withstand operation, and very few have furnished the important data concerning their fatal cases which might afford statistical evidence from which, in time, reliable standards might be deduced. After studying the subject, and particularly after analyzing certain cases which are given, Cheever draws the following conclusions:

1. During an acute exacerbation of the disease, or in periods of great mental depression, operation is contraindicated.

2. Muscular weakness, so great that the patient cannot walk, and marked loss of weight, with continued loss under absolute rest are serious contraindications.

3. Organic visceral disease, so serious as to jeopardize patients' having any operation of similar technical type, is a contraindication.

4. Operation should not be undertaken in the presence of an enlarged thymus, until its probable activity has been reduced by irradiation.

5. The Jewish race offers a distinctly higher operative mortality.

6. A metabolism of 30 introduces a serious risk, which undoubtedly increases with high rates, but not necessarily in proportion, and there is no rate of metabolism which alone contraindicates at least minor surgical procedures.

7. The "vagotonic" type is possibly more vulnerable to the operative ordeal than is the "sympathetico-tonic" but evidence on this point is as yet inconclusive.

8. The minor procedures, whether consisting of injections into the gland, cauterizing or ligating operations, are often most valuable indexes of a patient's resistance to trauma.

Basal Metabolism. Much has been written regarding this and it was the subject of a number of papers and rather extensive discussion³

¹ Acta Chir. Scand., 1921, **53**, 561.

² Archives of Surgery, 1921, **2**, 21.

³ Plummer, H. S.: Interrelationship of Function of the Thyroid Gland, Journal of the American Medical Association, July 23, 1921, **77**, 244; Benedict, F. G.: The Measurement and Standards of Basal Metabolism, p. 247. Lusk, Graham: Fundamental Ideas Regarding Basal Metabolism, p. 250. Boothby, W. M.: The Basal Metabolic Rate in Hyperthyroidism, p. 252. Means, J. H.: Determination of Basal Metabolism, *ibid.*, July 30, 1921, **77**, 347. DuBois, E. F.: The Basal Metabolism in Fever, p. 352. See also Lahey, Boston Medical and Surgical Journal, 1921, **184**, 348.

before the meeting of the American Medical Association in Boston last year. There is a certain fascination about having a certain mathematical index, relatively simple to ascertain and which will tell us just what to do and what not to do in toxic goiter. The advantages of having a numerical index is self-evident; it gives us at once a means of classifying our patients, a guide to treatment and a measure of the improvement under any particular treatment. We do not as yet have sufficient confidence in the metabolic rate to allow it precedence over the clinical picture; we regard it merely as one link in the chain of evidence and still rely upon our own judgment as to operative risk and surgical toleration in the interpretation of the symptom-complex, attaching greater significance to loss of weight, emotional instability and pulse-rate. Lahey believes that the metabolism rate, considered alone, is unreliable as a guide to the extent of the surgical procedure to be employed, it is at once evident that it is impossible to make any fixed statement concerning the percentage figures in basal metabolism at which it is safe to perform partial thyroidectomy as a primary procedure. Neither is it possible to state at what level of basal metabolic rate it is wise to ligate but one pole, nor is it further possible from basal metabolism estimations alone to weed out the cases too seriously afflicted to be submitted to any surgical procedure, and to be relegated to the less satisfactory and more prolonged methods of treatment not surgical in nature, such as rest and *x-ray* treatment. Still Lahey thinks that partial thyroidectomy may be employed as a primary measure unpreceded by ligation in most of the cases showing increases in metabolic rates of not over +35. In those cases showing a rate of between +35 and +30, Lahey believes that fine judgment must be exercised in deciding between pole ligation and primary partial thyroidectomy. Most cases showing a rate of above +50 should have primary ligation of one or both of the superior poles. In patients showing metabolic rates of from +75 up, extreme caution must be exercised in the extent of the surgical treatment employed. Else¹ believes that the basal metabolic rate is an indispensable index of the activity of the thyroid gland but that its height is not as important as is the course of the rate and the rapidity with which it is changing. With a rate below 25 per cent, he believes in medical treatment; with a rate between 25 and 50 per cent, thyroidectomy, without preliminary ligation can usually be done; with a rate between 50 and 75 per cent, ligation should be performed to be followed by thyroidectomy when the rate falls to 50 per cent or less; with a rate between 75 and 100 per cent, radical work should never be done until the superior thyroid arteries have been ligated. In the discussion on this paper, Lahey warns of the possibility of error from various sources and states that always must there be careful correlation of clinical symptoms with this laboratory measure. In his own paper he states that in many cases the final decision is made on the operating table after the degree of reaction to the anesthesia has been observed.

¹ Journal of the American Medical Association, 1921.

The Epinephrin Test. Recent investigations and analyses of groups of cases would seem to show that hypersensitiveness to epinephrin rises and falls with the metabolic rate. This hypersensitiveness probably depends more on changes in the sympathetic autonomic nervous system than upon the absorption of thyroxin. This test, sometimes called the "Goetsch Test," is still advocated by Goetsch¹ but the researches of Peabody² *et. al.*, Boothby and Sandiford,³ and others have shown that it should not be regarded as having any specific significance in the diagnosis of hyperthyroidism.

X-ray Treatment of Hyperthyroidism. Many articles appear on this subject but with only few exceptions they are of so unscientific a character as to be valueless. Most of us agree that the x-rays have a beneficial effect in the adolescent type of goiter with or without hyperthyroidism probably from the effect on the thymus. Some patients with soft thyroids and only a moderate rise in the metabolic rate are distinctly improved or even cured by x-ray treatment because of the effect on the patient's psychology. I can agree with Mayo⁴ when he writes: "With roentgen-ray treatment, remissions may occur just as remissions occur without treatment or with several other methods of treatment. Our experience has been failure or but temporary benefit. It is possible that the ray treatment may destroy the gland and produce hypothyroidism. It is difficult to regulate the dosage, and its use adds to the difficulties of operation." Regarding the latter point, we find Von den Hutten⁵ recording his observations and experiments which showed that there is a connection between x-ray irradiation of goiter and the formation of adhesions. Microscopically, he found no evidence of specific effect on goiter due to excessive irradiation. Additional information will be found in the paper by Crile⁶ and I note with interest the statement that Christie, at the Lakeside Hospital, found that bilateral partial thyroidectomy reduces the metabolism more markedly and more promptly than either x-rays or ligation, and that x-rays reduce the metabolism more than ligation.

THE MAMMARY GLAND.

Carcinoma of the Breast. The principal paper of the year on this subject, it seems to me, is that by Handley⁷, well known for his book and his writings on breast cancer. He makes the important point that statistics are not a weapon of primary importance in the search for truth, though they may supply useful secondary or confirmatory evidence. Neither does the "trying out" of operative procedures aided only by clinical observation place a subject entirely upon a rational basis. Sound pathological observation and, I might add, deductions from scientific experiment make for greater exactness. Basing his ideas on

¹ New York Medical Journal, 1921, **113**, 378.

² American Journal of the Medical Sciences, 1921, **161**, 508.

³ American Journal of Physiology, 1920, **51**, 200 and 407.

⁴ Surgery, Gynecology and Obstetrics, 1921, **32**, 209.

⁵ München. med. Wochenschr., 1921, **68**, 983.

⁶ Journal of the American Medical Association, 1921, **77**, 1324.

⁷ British Medical Journal, 1921, **1**, 37.

his well-known "permeation theory," Handley states that the operation for breast cancer must conform to the following conditions: "(1) The primary growth, from which centrifugal spread begins, must always be the center of the operation area. Thus an operation for a growth of the inner edge of the breast is not the same as an operation for a growth of the outer edge. (2) A circular area of skin 4 or 5 inches in diameter and centered upon the primary growth requires removal." Note that Handley advocates the excision of a rather small area of skin. He believes this unnecessary because the area of skin infected is small compared with the area of permeation in the deep fascia. He thinks that the Halstead operation is defective by reason of the small area of deep fascia ablated, as compared to the large area of skin removed. Fairly, he adds that 48 per cent of his cases remained free from recurrence as compared to the 47 per cent of Halstead. (Schloffer¹ states that the frequency of local recurrence is the result of skimping the skin excision. Through a wide skin excision there is less undermining and the resection of muscles and fascia is more complete.) "(3) A circular area of deep fascia 10 or 12 inches in diameter and centered upon the primary growth must be ablated. It is first exposed by raising thin flaps of skin and subcutaneous fat, then surrounded by a ring incision, then elevated all around its edge from the deep parts until the line is reached where muscle also must be removed. The removal of a maximal area of deep fascia is demanded by the presence in this layer of the growing edge of the disease. (4) The removal of deep fascia is often too limited in the epigastric region. I have shown that this region is especially dangerous because here only a layer of fibrous tissue separates the fascial plexus from the subperitoneal fat. It is here that by direct infiltration growth often reaches the peritoneal cavity. In all cases, except perhaps with a growth of the upper edge of the breast, an area of the anterior layer of the sheath of the rectus abdominis requires removal."

LYMPHATICS OF THE BREAST IN RELATION TO CARCINOMA. One of the interesting features regarding the operation for cancer of the breast is the discussion as to the proper handling of those cases with involvement of the *supraclavicular nodes* and whether or not we should include removal of the fat and lymphatic tissue of the supraclavicular region in our radical operation. I believe that in the Mayo clinic they consider cases inoperable which show invasion in this region. In the latest paper by Sistrunk,² it is stated that "it does not seem practicable to remove the supraclavicular glands in all patients operated on for cancer of the breast, and it is doubtful that much good would be accomplished by such a procedure." Handley states that "no operative method for breast cancer is satisfactory which does not as a routine take steps to counter infection of those glands." Childe³ states that he adds the supraclavicular dissection when the primary growth is situated in the upper part of the breast and if palpable glands are present in the axilla.

¹ Zentralbl. f. Chir., 1921, **48**, 1310.

² Pennsylvania Medical Journal, 1921, **24**, 781.

³ British Medical Journal, 1921, **1**, 401.

Greenough and Simmons¹ did the supraclavicular dissection, in 14 cases of their series, as part of the primary operation and in 2 cases as a secondary measure. In no case when disease existed above the clavicle was a successful result obtained and hence they now rarely perform this dissection and believe that cases with disease in this region may be considered as beyond operative relief. Eisendrath² believes that in cancers of the upper half of the breast we should remove all of the fat and other tissues as far as the clavicle, and, if possible, to the subclavian vein itself. His article includes a full summary of the investigations of Mornard³ on the relation of the lymphatics of the breast. The illustrations are quite interesting (Figs. 18 to 23). They explain many of the cases in which the first evidence of a recurrence is in the supraclavicular nodes.

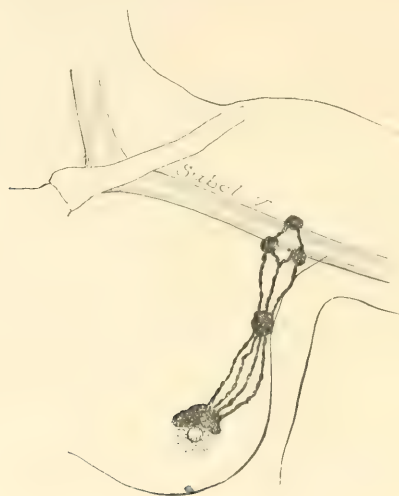


FIG. 18.—Three to five lymphatic trunks leave the outer and lower border of the mammary gland and reach the central group of lymph nodes lying on the axillary vein. The first set of relay nodes are shown lying along the outer border of the pectoralis major muscle. (After Mornard.)

Handley states that "In regard to the thorax the position is less unfavorable. It seems doubtful whether any direct vascular connection exists between the pretracheal glands of the thorax and the supraclavicular glands. In many cases the pretracheal efferent trunks discharge directly into the great veins, and the avenue of permeation into them is thus cut off. It would seem that the only constant lymph vascular connection of the supraclavicular glands with the thorax is by way of the efferents of the small recurrent laryngeal chain of glands. This conclusion is an important one, for it justifies the hope that, as experience has now shown, a vigorous attack on enlarged supraclavicular glands may anticipate and prevent invasion of the thorax. If, however,

¹ Boston Medical and Surgical Journal, 1921, **185**, 253.

² Surgical Clinics of North America, 1921, **1**, 1025.

³ Rev. d. Chir., 1916, **51**, 462.

periglandular infiltration with fixation of the enlarged glands has taken place, it is likely that infiltration of the dome of the closely adjacent pleura has occurred, and in such cases operation is useless.

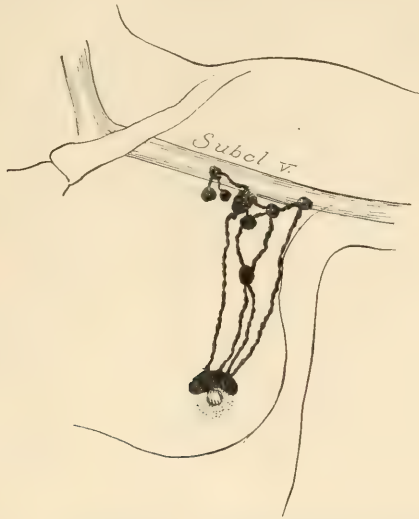


FIG. 19.—(Type 2). Lymphatic trunks leading to the humeral chain (outer axillary). In this illustration Mornard shows how the lymphatics from the outer half of the breast lead not only to the center but to the outer axillary lymph nodes. (After Mornard.)



FIG. 20.—(Type 3.) Two lymphatic trunks (axillary and subclavicular). One of these proceeds directly to the central axillary group of lymph nodes, with an occasional relay node along the lower border of the pectoralis major muscle, while the other trunk proceeds directly to the group of nodes lying beneath the clavicle. (After Mornard.)

"The definite break in the continuity of the permeation channels imposed by the separate termination in the great veins of the lymphatics of the neck and of the thorax respectively is, as we have seen, a great encouragement to the surgeon who contemplates an attack upon supra-

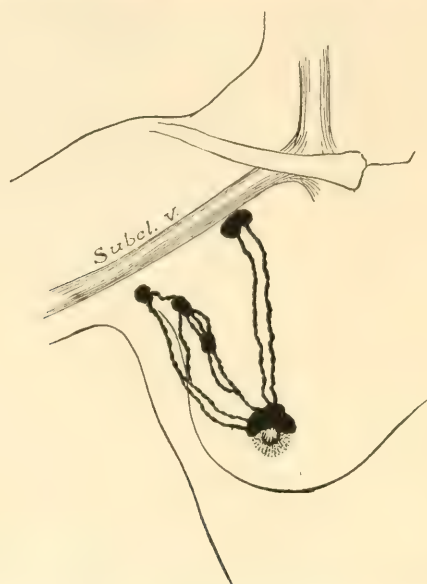


FIG. 21.—Complete independence of the two lymphatic trunks leading to the axillary and subclavicular lymph nodes respectively. (After Mornard.)

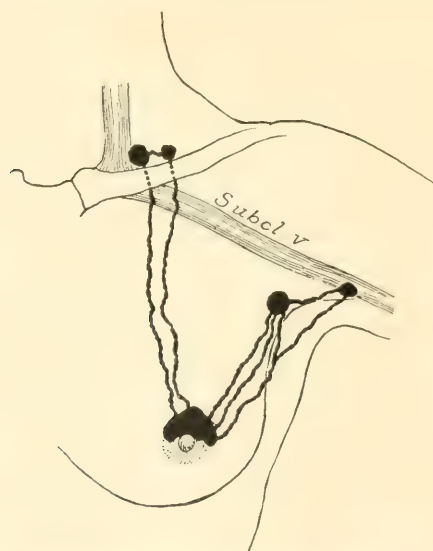


FIG. 22.—Lymphatic trunks leading separately to the axillary and subclavicular lymph nodes. This direct route to the subclavicular region explains how an early invasion of this region may occur, especially in cancers of the upper, inner quadrant. (After Mornard.)

clavicular glands. The complexity and extent of their lymph-vascular connections in the neck is a factor which at first sight seems very unfavorable to operation. But all the glands in the posterior triangle are within operative reach, and so, too are the deep or internal jugular glands. Acting on the advice of the late Sir Henry Butlin, Handley has for some years made it a rule, in cases of infected supraclavicular glands, to perform a complete lymphatic dissection of the posterior triangle, including also the internal jugular glands. The glands are removed in one piece still embedded in the connective tissue, and therefore with all their lymph-vascular connections intact." In regard to late cases or recurrence in the supraclavicular region, Handley believes that, if mobile, they should be operated on, but, if fixed, they should be left alone,



FIG. 23.—Topography of lymph nodes of the sub- and supraclavicular region, showing how carcinoma travels from the breast to the sub- and supraclavicular regions directly without much involvement of the axillary lymph nodes. In the supraclavicular region are seen two sets of nodes described by Mornard, namely, the internal and external. (After Mornard.)

unless the fixed gland is situated at the lower and inner angle of the posterior triangle, in which event it is enucleated and radium introduced into the bed from which it came. Handley also strongly advises the use of radium in the wound after all operations for supraclavicular glands. If we examine Fig. 22 another point made by Handley is better understood. He has found a recurrence in the *subclavian glands*, presenting as a deep lump situated below the middle of the clavicle, and sometimes adherent to this bone. It will be seen in the practice of those surgeons who do not clear the axilla up to its extreme apex. Even when the lower axillary glands are still free from disease, a lymphatic trunk passing directly from the breast may infect the subclavian group at the apex of the axilla.

EXPLORATORY OPERATIONS. Greenough and Simmons emphasize the extreme danger of local excision of suspicious tumors of the breast unless facilities are available for frozen section diagnosis and immediate completion of the radical operation when cancer is disclosed. Even if the exploration is done in this way, the utmost care should be employed to protect the tissues from implantation. The incised surfaces should be cauterized with carbolic acid, formalin, or the actual cautery, and the entire layout of instruments and dry goods discarded for a new outfit to finish the operation if cancer is discovered.

While I agree with the above contentions in all particulars, it is only fair to add that Sistrunk believes that removal of the tumor followed by radical amputation later does not necessarily offer a bad prognosis provided the tumor is not cut into during its removal. Four of six patients so treated were alive from five to eight years after operation. Bloodgood follows the procedure advised by Greenough and Simmons. He does not favor the frozen section, preferring to rest the diagnosis on gross inspection and palpation of the explored lesion. If the operator *must* have a frozen section, he advises excising the tumor with a good zone of breast and temporary packing of the wound while waiting for the diagnosis.

PROGNOSIS IN MAMMARY CANCER. Anyone who attempts to work up the literature on cancer and the results of operation or other treatment is confused by the difficulty of combining the figures published owing to the varying conditions under which the statistics were prepared. Greenough and Simmons offer a standard form for the report of end-results. It is briefly, as follows:

"1. A definite period of time has been selected ending at least three years prior to the report, and all of the cases entered in the hospital records under the given diagnosis have been investigated.

"2. No case has been accepted as cancer without proof by pathological examination, or subsequent recurrence, or autopsy.

"3. Cases which have survived, at last report, only a portion of the necessary three-year period, are eliminated as inconclusive.

"4. Cases not traced at all after discharge from the hospital, and not appearing in the mortality statistics of their place of residence, are eliminated as inconclusive.

"5. All cases fulfilling the above requirements are published and counted in the statistics with such subdivision into radical and palliative operations as may seem expedient."

I believe it important that the type of carcinoma be considered because, as shown by Bloodgood and others, the so-called adenocarcinoma is far more amenable to cure by operation than the other forms. Furthermore, some surgeons never operate if they palpate glands in the supraclavicular region or if the axillary mass is adherent to the chest wall or vessels. A statement therefore of the number of cases refused operation must be included in the statistical evidence. Finally, the position of the cancer in the breast is important in estimating end-results. Five years seems to be the time limit at the present time and consequently many of the old statistics will need revision or must be

discarded entirely. In 1918, Jacobson¹ collected 3462 cases of radical operation for breast cancer, performed by various surgeons, of which 23.77 per cent were well at the end of five years. Some of the most recent statistics show the following results: Sistrunk found that at the end of five years 29, or 22 per cent of 132 patients in whom glandular involvement was demonstrated at the time of operation were found to be alive, and of the 86 patients in whom the glands were not involved at the time of operation, 56, or 65.1 per cent were alive. When considered without reference to glandular involvement 85 of 218 patients, or 39 per cent, were found to be alive at the end of five years. Greenough and Simmons report on the end-results of 95 cases with a cure of approximately 25 per cent. The following table shows the advantage of being able to operate in the early stage of the disease.

Class.	Case.	"Cures."	Percentages.
1. Early favorable (no enlarged glands) .	14	10	71
2. Favorable (glands slightly enlarged) .	26	9	33
3. Average cases (glands markedly enlarged) .	29	3	10
4. Advanced cases (palliative operation) .	17	1	5
5. Hopeless cases (no operation)	9		

Weismann² reports upon the results of 106 cases of which 23.4 per cent of the total number, or 26.3 per cent of the traced cases, are considered permanently cured. Davis³ reports that of 190 cases, 39.5 per cent of the total number and 62 per cent of the traced cases were considered cured for a period over three years. Davis also remarks "no one any longer reports his cancer patients as cured. A three year limit or a five year limit is purely arbitrary. It is considered that each year elapsing after a radical operation without a return of the disease makes recurrence less likely."

ELEPHANTIASIS CHIRURGICA. Swelling of the arm after the radical operation for cancer of the breast may be due to blocking of the lymphatics, obstruction in the vein, or, as Halsted⁴ believes, more frequently infections play a conspicuous part in determining the amount of swelling and the time of its occurrence. Since his adoption, nine years ago, of the skin-grafting operation, with modified incision and changes in method of closing the wound, swelling of the arm, previously so frequently seen, rarely occurs. Since extreme abduction of the arm was formerly prevented by a cicatricial band in the line of the scar, the incision down the arm has been abandoned and the upper skin edge sutured to the first intercostal muscle and fascia so as to raise the axillary fornix to the highest point, thereby eliminating the possibility of tug on any part of the skin or scar. No attempt is made to approximate the cut edges of the skin at the upper half of the denuded area, these flaps being rather pressed away from the center of the wound and stitched to the underlying muscles of the thoracic wall, thus securing for the intraclavicular and axillary regions a superabundance of skin

¹ Ohio State Medical Journal, 1918, **14**, 524.

² Beitr. z. klin. Chir., 1921, **122**, 181.

³ Archives of Surgery, 1921, **3**, 348.

⁴ Bulletin of Johns Hopkins Hospital, 1921, **32**, 309.

and complete freedom of all moments, together with the avoidance of any subclavicular dead space.

CAUTERY INCISIONS FOR BREAST CANCER. In several clinics I have noted surgeons removing the breast from the chest wall and even making the skin incisions with the cautery. Percy¹ believes that the hot knife devitalizes any malignant cells which are not removed, spoils the soil for further development of cancer, and never vaccinates cancer into any areas. His article is well-illustrated and, as he states in the text,



FIG. 24.—Incision is first lightly outlined on skin with cautery tip and then started by thrusting it through the elevated skin into subcutaneous fat and continued by following the outline. Always cut from within outward with the cautery knife. A less extensive excision may be considered desirable with the formation of flaps which permit of closure in early cases and where the growth is small and movable. Note relation of incision to cephalic vein. (Percy.)

the only instrument used is the electric cautery knife, only an occasional hemostat being required. Gauze sponges are rarely needed except to mop up the melted fat, and they are allowed to touch the operated surface only once when they are discarded. As a result of the use of this method, he offers the following conclusions which he believes will improve very materially the present-day statistics of this operation.

¹ Surgery, Gynecology and Obstetrics, 1921, **33**, 417.

1. That only the hot knife be used in the removal of breast carcinoma, including a complete dissection of the axilla.

2. That in the advanced type of case no attempt be made to preserve or secure the skin flap.

3. That the skin around the denuded area (left without flaps when the breast and axillary glands are removed) be undermined from 2 to 4 inches with the hot knife.

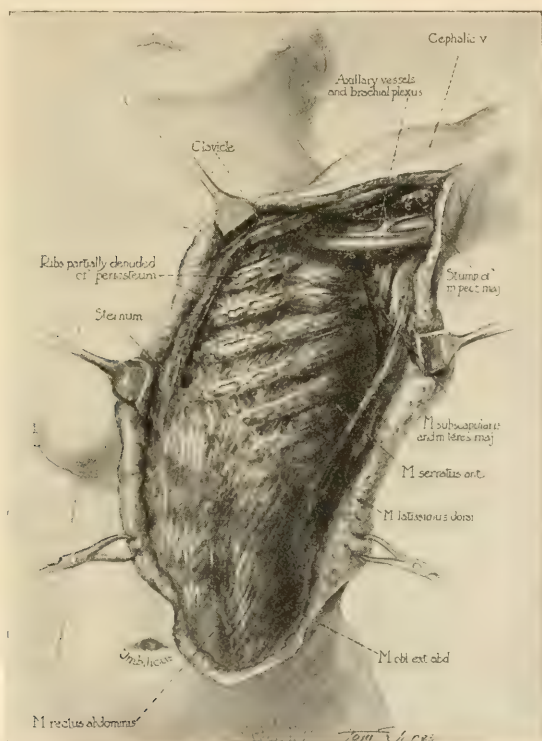


FIG. 25.—The completed dissection. This is done with the cautery knife only. The edges of the wound are extensively mobilized, the brachial plexus and axillary vessels are dissected free with the hot knife leaving them absolutely clean and cancer free. The heat is thoroughly spilled into the apex of the axilla and also over the fascial coverings of the rectus muscle down to and including the umbilical region. A temperature sufficient to melt fat is usually all that is required in these regions. As a last procedure the cautery shank is slowly passed over the intercostal muscles. This accounts for some of the destruction of the rib periosteum shown in the illustration. (Percy.)

4. That in the after-treatment, besides the use of Dakin's solution, the arm on the operated side be maintained in an elevated position with the forearm resting on the top of the head, until practically the surface denuded by the hot knife is entirely covered with new skin.

5. That vigorous, daily massage and forcible movement of the skin and arm adjacent to the denuded area be instituted as soon as granulations have commenced to appear.

6. That the only carcinoma of the breast considered inoperable by the heat technic is the one where inaccessible metastasis has developed. I am reproducing a few of his illustrations.

INCIDENCE OF CANCER IN THE SECOND BREAST. One often observes a metastasis in the second breast which is believed to be a direct extension from the original tumor through the lymphatics. Kilgore¹ offers the ingenious suggestion that a woman with cancer of one breast develops



FIG. 26.—The completed operation. The skin edges are hooked on to No. 14 copper wire (English standard), protected at intervals by sections of split rubber tubing. The arm is kept constantly over the head except when the wound is dressed. A rubber dam drain is placed below and at the back. The first dressing is made in three or four days and narrow rubber tissue strips are then applied across the wound at inch intervals. Dakin's or eusol solution is applied after the first dressing until granulations appear, then dichloramine-T is substituted. The arm is maintained in the position indicated by a "clove-hitch" and fastened around the opposite shoulder by a rather ample or thick gauze bandage. (Percy.)

a susceptibility of the other breast to cancer. He states that the expectancy of cancer of the breast is about 2 per cent for all ages. He then shows from a series of cases that a woman who lives five years or more after the first breast cancer has been removed is from 7 to 10 per cent. He then raises the question of the advisability of removal of the second breast to protect against cancer. He thinks that if a patient

¹ Journal of the American Medical Association, 1921, 77, 454.

free from metastasis from five or more years, develops cancer of the second breast, is operated on, and in the course of from one to three years develops metastases or recurrences on the side of the second breast, and dies after about the usual length of life, for primary cancer, the reasonable presumption is that this patient's life might have been saved by removing the second breast before cancer developed in it. This would be particularly true if the second cancer were primary, and probably the patient's life would have been saved had the second cancer been recurrent, inasmuch as the other metastasis developed only after an interval of time following the incidence of the second breast cancer and apparently came from it.

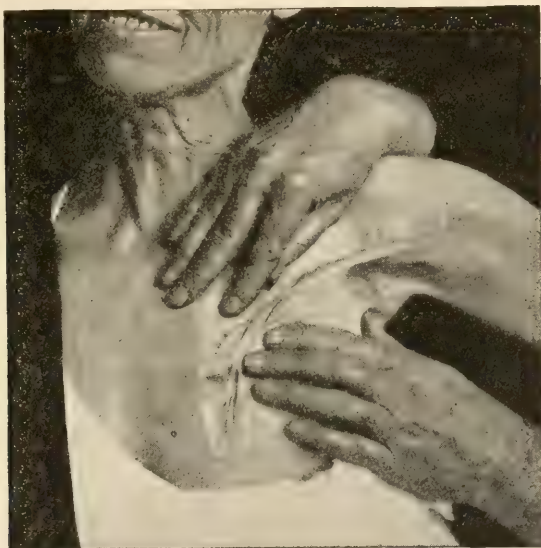


FIG. 27.—Showing the movability of the new skin following an extensive cauterly dissection in an advanced breast carcinoma, November, 1914. In this patient flaps were made for the upper part of the wound with the cautery and applied over the axilla. Movement of the arm was practically normal in a year following the operation. (Percy.)

From his records, he believes that had he performed 257 excisions of the second breast, about 10 deaths might have been prevented. He advocates resection of the second breast as soon as convenient after the first operation when it is determined from pathological study that the axilla is not involved. Those patients who have axillary involvement at the first operation should be urged to return within three years and then, if free from recurrence, have the second breast excised. Kilgore brings out one interesting point, namely, that far from being put on their guard by one experience, several of the patients observed tumors in the second breast from two to nine months before coming for treatment. In the discussion on this paper, Greenough states that out of 639 cases of breast cancer, he found 35 cases showing cancer of both breasts. An analysis of these showed that the routine removal of the second breast

would only have benefited 2 patients. The important point in Greenough's discussion is the statement that a patient with cancer should never be discharged but should be subjected to repeated and periodic reëxamination.

Massive Hypertrophy of the Breast. This interesting anomaly is well considered by Keyser¹ of the Mayo Clinic. He presents 4 cases with illustrations, showing the pathology to be either a fibroepithelial or adipose overgrowth. The lesion may occur between the ages of twelve and forty-eight, but is most frequently associated with puberty or pregnancy, and he suggests that the massive hypertrophy may be etiologically related to an ovarian malfunction. In regard to treatment, he believes that one should wait for a length of time consistent with the health and mental composure of the patient, in the hope that the enlarged breasts will decrease in size. Drugs and local applications are apparently of no avail. Opothrapy may offer hope in the future when this field of medicine has been better developed. If time fails to ameliorate the condition, and the patient is desirous of being rid of the deformity, amputation is indicated.

Radiation in Cancer of the Breast. In common with other organs in which cancer is a frequent occurrence, serious attention has been given to the treatment of cancer of the breast by means of radium or the x-ray. At the present time the status of these agents in the treatment of cancer of the breast is in a state of confusion and no reliable data yet exists to show that they have materially reduced the incidence of recurrence. It is true that a number of isolated cases and a few small groups attest their value but the number is not sufficient to make an impression upon the general medical public. As Pfahler² well says, "the greatest amount of skill and thoroughness is necessary if success is to be obtained, and in many instances failure will result even then." No reliance should be placed on the statements of those who are not experienced in the handling of these agents and who do not report their cases in a scientific clear-cut way. The remarks of Greenough and Simmons regarding operation are equally apropos of the reporting of the results of radiation.

I notice another statement in Pfahler's paper with which I quite agree. He questions the advisability of any attempt at the removal of recurrent nodules for the reason that if the original operation, cleanly done at a time when operation was much more favorable, failed at that time, how can we hope for success in the latter stages. He treats the localized nodules in the line of the incision in the axilla, or in the supra-clavicular region with radium. Pfahler makes another interesting statement, namely that 50 per cent of the patients who come to him for post-operative treatment have already mediastinal and pulmonary involvement. He believes that this is due to the fact that usually only advanced cases are sent for radiation. This statement should be followed up because what is the use of operating upon a case of cancer of the breast with metastasis to the lung or mediastinum. At the most, the so-called

¹ Surgery, Gynecology and Obstetrics, 1921, **23**, 607.

² American Journal of Roentgenology, 1920, **7**, 328.

"incomplete operation" should be done on these patients and the final hope placed upon the deep *x-ray* treatment.

Handley mentions the advantage of *postoperative* radiation to destroy any groups of cancer cells.

In a valuable recent paper, Quick¹ advises the use of *radium* in a combination with *x-ray*:

(a) Localized flat recurrences where surface applications of radium can be made directly over the lesion.

(b) Bulky recurrences where radium emanation can be embedded directly into the tumor.

(c) Axillary involvement which is always difficult to influence favorably with *x-ray* alone, where radium emanation can be embedded in the neoplasm or in axillary fat tissue so as to give a diffuse radiation of the axillary space from within.

(d) Inoperable primary cases where embedded emanation can be utilized to radiate the tumor from within, as well as the axilla, and even supraclavicular space in the same way, if necessary.

(e) Primary cases refusing operation where treatment may be carried out much in the same way as in the inoperable primary cases.

The combination of radium and *x-ray* may, in some instances, change an inoperable into an operable case. Quick also offers certain theoretical considerations which seem of value. When one embeds radium emanation needles in a primary tumor and in invaded lymph nodes and follows with massive *x-ray* dosage through the skin, a powerful destructive effect is produced on the tumor tissue amounting to local necrosis, the lymphatics may reasonably be considered sealed, invisible vagrant cells are incarcerated or destroyed, and all this is accomplished without removing the natural barriers which exist against progressive carcinoma. In fact both types of radiation tend to increase the exudation of lymphocytes and plasma cells and the growth of connective tissue around the tumor, and these are the only natural agents of resistance to carcinoma that we know anything about. The treatment of mammary cancer by these physical agents is, therefore, based on sound theory since it intensifies the natural reaction of the tissues to carcinoma, while producing, in addition, a very strong destructive action on the tumor cells. Most writers on this subject advise such a procedure. But the *preoperative* use of radiation is but little known if one may judge from the published papers on breast cancer. It would seem evident from Sistrunk's remarks in the discussion on his paper that preoperative radiation is not practised at the Mayo Clinic. Handley evidently thinks well of it but makes the significant statement that there are striking differences in the vulnerability of carcinomata to radium and that small doses may stimulate cell activity and mitosis. Also that we must guard against lowering the general resistance of the body to the disease. He believes that efforts should be made along the line of immunization to so alter the soil as to make its growth impossible, and quotes approvingly the work of Russ on the action of radium on the response of normal tissues to the tumor growth. He believes that *x-rays* are especially

¹ Surgery, Gynecology and Obstetrics, 1921, **32**, 156.

suitable for prophylactic irradiation covering a wide area, or for the treatment of multiple scattered deposits in the parietes. Radium should be chosen in preference if the recurrence is single or if nodules are only present in one or several limited areas. Radium should be preferred to x -rays provided that the affected area is not too large to be dealt with, for he has frequently seen deposits refractory to x -rays rapidly disappear under radium.

STATISTICS REGARDING EXCISION SUPPLEMENTED BY RADIATION. While it is true that the statistical evidence as to the effect of post-operative radiation, as to whether it has increased the probability of successful treatment by combination methods is not yet convincing mostly by reason of faulty presentation of data, it seems worth while to reproduce from the literature those statistics bearing on the subject. The largest amount of the literature relating to radiation supplementary to the excision of mammary cancer has been published in the German literature. The recent articles have been brought together in a review¹ published for the Medical Research Council of Great Britain which I am reproducing verbatim. Blumenthal² gave the results of postoperative radiation at the Charité in Berlin within the years 1915-1919. All the cases had undergone a radical excision by various surgeons, the majority at the Charité, the minority by outside practitioners.

1915. Sixty cases. Twelve had already been x -rayed elsewhere, of whom 7 already had metastasis, 3 developed metastases under treatment, and 2 continued free from disease; 6 were sent direct for radiation, of whom 2 had already metastases; 2 developed recurrence and metastasis under treatment, and 2 continued free from disease; 42 had already recurrence.

Result to the end of 1919: Fifteen (25 per cent) continued free from recurrence and metastases.

1916. Sixty-three cases. Nine already x -rayed elsewhere, of whom 3 had already recurrence, 5 had already metastases, and 1 continued free; 8 were sent direct for radiation, of whom 2 had already metastases, 2 developed recurrence and metastases, and 3 continued well; 46 had already recurrence.

Result to the end of 1919: Twenty-three (36.5 per cent) continued free from recurrence and metastases.

1917. Sixty-four cases. Eleven had been x -rayed elsewhere, of whom 4 had already recurrence, 6 had already metastases, and 1 continued free; 11 were sent directly for radiation, of whom 7 had already metastases, 1 developed metastases and 3 continued free; 42 had already recurrences.

Result to the end of 1919: Twenty-nine (45.3 per cent) continued free from recurrence and metastases.

1918. Seventy-seven cases. Twenty-five had been already x -rayed elsewhere, of whom 4 had already recurrence, 10 had already metastases, 6 developed recurrence and metastases, and 4 continued free; 31 were

¹ Medical Science, 1921, 4, 418.

² Deutsche med. Wchnschr., 1920, 46, 505.

sent direct for radiation, of whom 4 had already metastases, 6 developed recurrence and metastases, and 21 continued free.

Result to the end of 1919: Thirty-one (40 per cent) continued free from recurrence and metastases.

1919. Sixty cases. Result to the end of the year: Forty-six (76.6 per cent) continued free from recurrence and metastases.

Allowing for the shorter periods after operation, Blumenthal's later results do not show an advance in the success of radiation over that obtained in 1915, and on the whole are not appreciably better than some attained by excision alone.

Tichy¹ reported cases at Marburg under the following headings. Group I from the year 1904 to 1914, which were not *x*-rayed after operation. Group II from 1914 to 1917, the scar *x*-rayed at least once, or the scar, also the axillary and supraclavicular region, *x*-rayed several times. Group III in 1918 and 1919 intensively *x*-rayed after operation.

	I.	II.	III.
Total number	62	36 and 25	11
Recurrence within one year	7 (11.2%)	23 (37.7%)	5 (45.5%)
Metastases developed	3 (4.8%)	7 (12.1%)	2 (18 %)
Recurrence within three years . . .	20 (32.2%)	37 (60.6%)	
Late recurrence	1 after nine years		
Free from recurrence after three years	24 (38.7%)	23 (37.7%)	
Free from recurrence after five years	13 (20%)	19 (31.8%)	

On the face of it, these statistics show an increase of early recurrence and of metastases since the introduction of radiation. Against this it may be claimed that, owing to the war, the women were operated upon at a later stage and were less well nourished.

Statistics furnished by Perthes² and by Neher³ concerning cases at Tübingen were arranged in the same way as the preceding ones. Group I included cases submitted to radical excision in the years 1910 to 1912 which were not *x*-rayed; Group II during 1913 to 1916 lightly *x*-rayed, Group III from 1916 to 1918 intensively *x*-rayed.

	I.	II.	III.
Total number	130	144	72
Recurrence within one year	37 (28.0%)	55 (38.2%)	30 (41%)
Recurrence within three years . . .	62 (47.5%)	78 (54.2%)	
Metastases without local recurrence .	14 (11%)	18 (12.6%)	13 (18%)
			multiplicity of internal metastases very marked.
Free from recurrence after three years	50 (38.5%)	44 (30.5%)	
Free from recurrence after five years	36 (27.7%)	5 (20.3%)	
Free from recurrence after six years	32 (24.6%)	No case of recurrence after six years.	

In 27 cases the primary tumor was not larger than an egg, it was adherent neither to the skin nor the pectoral muscle, and there was no clinical evidence of enlarged glands. Of these 27, 23 (85.2 per cent) were alive without recurrence or metastasis over three years after the

¹ Zentralbl. f. Chir., 1920, 47, 470.

² Ibid., 25.

³ Beitr. z. klin. Chir., 1920, 47, 25.

operation, 1 died of the operation, 2 died without recurrence, and 1 (3.7 per cent) died of recurrence.

Of the cases in which supraclavicular glands were removed, whether x-rayed or not, only 1 remained alive and free from recurrence; all the rest were dead.

Kastner¹ grouped the cases under Payr at Leipzig in the same way. Recurrence within the first year after the operation was not diminished, so that Payr had for the time being dispensed with a costly procedure.

	I.	II.	III.
Total cases	69	22	42
Recurrence within one year	33%	36%	47.6%

A different arrangement was adopted by Lehmann and Scheven² in publishing the experience over cases at Rostock, and by Hoffman³ on cases at Heidelberg. The classification was made in accordance with the clinical examination previous to the operation.

Lehmann and Scheven's classification:

- I. Mobile tumors without clinical evidence of enlarged glands.
- II. Tumors adherent to skin or muscle or with enlarged glands.
- III. Tumors adherent to skin, and/or, muscle, and with enlarged glands.
- IV. Tumors with enlarged supraclavicular glands.

I. Free from recurrence after three years.	Not rayed	61.5%	x-rayed	8%
II. " " " " " "	"	27.1%	"	45.7%
III. " " " " " "	"	7.6%	"	27.7%
IV. " " " " " "	"	0	"	0
Average		32.7%	"	47.5%
Free from recurrence over five years		27.7%		

Hoffmann's report on cases at Heidelberg was a continuation of those extending over forty years.

Since 1915 prophylactic radiation had been carried out in all cases, as well as x-ray and radium treatment for recurrence.

Group I included tumors not larger than a walnut, of slow growth, not adherent to deep structures, not adherent or only slightly adherent to the skin, and without evidence of enlarged axillary glands.

Of 40 cases within the previous twenty years, 12 (30 per cent) died within three years, 24 (60 per cent) were alive and free from recurrence after five years. The cases which died of recurrence were chiefly those first diagnosed as cases of fibroadenoma. The subsequent radiation appeared to afford no better results than had been previously achieved by excision alone.

Group II included cases more or less extensively adherent to the skin and pectoral fascia, with axillary glands perceptibly enlarged.

Fifty-eight cases were not prophylactically x-rayed after operation; of these, 29.3 per cent were alive and free from recurrence over three years.

¹ Beitr. z. klin. Chir., 1921, **121**, 413.

² Deutsche Ztschr. f. chir., 1920, **153**, 331.

³ Beitr. z. klin. Chir., 1921, **121**, 1400.

Forty-nine cases were prophylactically *x*-rayed and 40 per cent were alive and free from recurrence over three years after.

Under this group, therefore, there was a 10 per cent improvement in those prophylactically *x*-rayed.

Group III were cases in which the cancer involved the whole breast, extensively adhered to the skin and pectoral muscle, and had already invaded the axillary and in some cases also the supraclavicular glands.

Sixty-six cases of whom 60 died within three years, 3 between three and five years, and 3 were alive without recurrence over five years. One of these was a bilateral case, and in 2 the supraclavicular glands were removed.

The prophylactic *x*-raying produced no improvement over treatment by excision alone, but there was no evidence of harm done by the radiation.

Brattstrom¹ reported the cases which had been operated upon at Lund between 1898 and 1915. Supplementary radiation treatment had only been systematically adopted after that period.

	1898-1905.	1905-1915.
Total cases	84	212
Died after operation	1	1
Unheard of	6	13
Recurred and died	50	133
Free from recurrence over three years	27	63
Later recurrence	2	5
Combining the series and so far as known.		
Survival free from recurrence over three years		29.3%
Survival free from recurrence over five years		23%

Boss² divided the Breslau cases in the same way as Hoffmann's Heidelberg cases.

Group I	23 cases	70 per cent survived three years
Group II	69 "	60 " " " "
Group III	15 "	14 " " " "

At Breslau the general conclusions as to radiation were that scirrhus and allied cancers, when they recurred locally, were amenable to *x*-ray treatment and the disease might be arrested. Infiltrating and medullary cancers tending to internal metastasis were refractory to radiation.

Chronic Cystic Mastitis. In an article of nearly 100 pages and 91 illustrations, Bloodgood³ describes the pathology of the various types of chronic cystic mastitis. He classifies the disease as follows:

I. Single or multiple cysts in chronic cystic mastitis (210 cases).

1. The blue domed cyst (174 cases).

2. The cyst of the galactocoele type (8 cases).

3. The multiple blue domed cyst, in one or both breasts (28 cases).

¹ Acta Chir. Scand., 1920, **53**, 146-153. ² Beitr. z. klin. Chir., 1921, **121**, 642.

³ Archives of Surgery, 1831, **3**, 445.

II. Chronic cystic mastitis, without large cysts (140 cases).

4. The non-encapsulated adenomatous area (48 cases).
5. The non-encapsulated area of chronic cystic mastitis, containing one or more minute cysts, or one or more dilated ducts, or both (39 cases).
6. The diffuse dilatation of the duct, chiefly in the nipple zone, rarely in the breast outside this zone (22 cases).
7. The non-encapsulated cystic adenoma (18 cases).
8. The diffuse non-encapsulated cystic adenoma (13 cases).

Space does not permit a description of the pathology of each of these types, as given by Bloodgood. The most important statement which he makes is that "chronic cystic mastitis is not a lesion of the breast which at the present may be considered precancerous, and its presence does not demand either the complete excision of the breast or the complete operation for cancer." He has records of 750 benign lesions of the breast in women over twenty-five years of age, of which 350, or almost 50 per cent, belong to the type chronic cystic mastitis, and "these women run no more risk of cancer than any other group of women of the same age." These statements are most interesting in view of the fact that most writers on this disease definitely consider it precancerous and that the recent popular literature used in the anticancer propaganda does the same. The paper contains many other interesting observations. For instance, Bloodgood says that with an experience of more than 900 breast lesions, he does not believe that one needs more than the palpable tumor, exposed at operation, to make the differential diagnosis. Again, he says, that the development of cancer in the breast, after the removal of a zone the seat of chronic cystic mastitis, is apparently not more frequent than the normal incidence of cancer in the same number of women in the same age who had not been operated on.

Insofar as I can make out from his paper, he believes that only in groups 7 and 8, the isolated and diffuse non-encapsulated cystic adenoma, is it necessary to remove the breast or to perform the complete operation. The entire article will well repay careful reading. Bloodgood promises a second paper in which the relation of the extent of operation to the clinical picture and pathology at exploration will be detailed.

In contrast to the opinion of Bloodgood, we should read the papers by Cheate.¹ In his first paper cysts and primary cancer in cysts are considered, and his ideas are derived from observations made from "whole sections" of the breast. He does not believe that cysts of the breast are mainly due to mechanical obstruction, the appearance of the epithelium seeming to indicate that its proliferation is causing the cyst rather than the reverse. Although all the ducts in their passage through the nipple are obstructed, there is no dilatation of the ducts below the nipple except those which contained new growth. He then shows by citations of cases and illustrations that cancer can begin in cysts whatever be their origin. The cysts may assist in the spread of cancer: (1) Two cancer-

¹ British Journal of Surgery, 1920, 8, 149 and 1921, 8, 285.

bearing cysts may coalesce; (2) a cancer-bearing cyst may invade a simple cyst; (3) a cancer-bearing periduct lymphatic vessel may invade a simple cyst or a cancer cyst.

He believes that the type of cyst which arises from dilated ducts is chiefly concerned in harboring the incidence of cancer.

In his second paper he demonstrates the great variation in the number of benign duct papillomata in breasts and deals with primary malignant disease in ducts. He demonstrates that the primary cancer process transforming epithelial into malignant cells may commonly operate on extensive duct surfaces, and once established at one part of the duct may affect other parts of it or other ducts. He suggests a genetic process in the spread of cancer, in addition to the "infiltrating" and "permeating" processes in the lymphatic system.

Paget's Disease of the Nipple. Kilgore¹ states that after an intensive study of the condition the term "Paget's disease" should be limited to those lesions presenting the typical histology: (a) Epithelial hypertrophy; (b) subepithelial round-cell infiltration; (c) Paget's cells. He studied the material in the Johns Hopkins Hospital laboratory and studied 4 cases. Three of these showed that Paget's disease is usually primary to cancer of the breast which has been found constantly in association with it. A fourth case is reported in which all the evidence of history and pathology points to a reversal of this order, the cancer in the breast apparently originated first, and was followed by Paget's disease of the nipple. If the deductions in this case are correct then both schools in the controversy over the primary or secondary nature of Paget's disease have been right, since either order of events may occur. Finally, he states that all the reported cases emphasize the importance of removing the entire breast for any chronic, persisting nipple eczema or ulcer, regardless of the apparent presence or absence clinically of deeper breast changes. At operation, the decision for or against axillary dissection should depend, not on frozen section diagnosis of the nipple condition between true Paget's and other eczemas, but on the pathological condition of the breast itself. The best procedure is amputation of the breast with a wide zone of skin, using the knife cautery in cutting across the lymphatics leading to the axilla, and proceeding immediately to the axillary dissection if any gross or frozen section evidence of cancer be found in the excised breast.

¹ Archives of Surgery, 1921, 3, 324.

SURGERY OF THE THORACIC CAVITY.

By GEORGE P. MÜLLER, M.D.

SURGERY OF THE HEART.

Heart Massage. Once more I feel impelled to present this subject in these pages despite the rarity of its performance. Last year I abstracted Fisher's excellent paper, and, as a sequel to this, we have one by Gunn¹ who takes up the statement made by Fisher that, "it will be of great help if an understanding of the processes concerned is quickened by a clear pronouncement by physiologists, to whom we must look for guidance and more definite instructions." Gunn² had published a previous paper, in 1915, but I did not abstract it at that time. Some matter in the present paper is a repetition of the earlier one. Gunn advises heart massage in cardiac arrest from chloroform anesthesia, or from any other condition in which cardiac arrest is "accidental." If the heart has stopped, artificial respiration should be resorted to immediately by the usual methods. If, at the end of three or four minutes, no pulse can be felt, and especially if no heart beats can be heard on auscultation, adrenalin should be injected into an external jugular vein and the abdomen opened and the heart massaged intermittently. When the heart continues to beat regularly and strongly, an intravenous injection of atropine should be given. Artificial respiration should be kept up until natural respiration has begun. The body should be kept warm, because the animal does not easily recover its power of heat regulation.

Gunn explains the reason for the different procedures as follows: The massage should be gradual compression and abrupt relaxation at a rate less than half the normal heart rate to allow complete filling of the ventricles and interrupted at short intervals to allow the spontaneous beats to develop. The latter is of great importance because Gunn found, in his experimental work, that "when the feeblest beats have begun, even beats which fail to move the manometer, it is better to cease massage for some seconds so as to allow them to develop, and to apply short periods of massage intermittently, when it is usually found that perhaps by the third or fourth series the heart suddenly regains a normal rhythm and the blood-pressure rises rapidly."

He highly praises the efficacy of adrenalin in starting an arrested heart by antagonizing muscular paralysis, and suggests that if it be thrown into the vein it would probably reach the heart after a few effective compressions by massage. He does not mention direct puncture of the heart and I will refer to this later. Gunn also states that

¹ British Medical Journal, 1921, 1, 9.

² Journal of Pharmacology and Experimental Therapeutics, 1915, 31.

adrenalin may produce a permanent rise in blood-pressure by breaking the vicious circle of temporary paralysis of the vasomotor center and feebleness of the heart's contractions.

In regard to artificial respiration, he states that "the respiration does not commence immediately upon the heart beginning to beat again. It takes time for the respiratory center to recover. In animal experiments thirty minutes elapse between the starting of the spontaneous heart beats by massage and the beginning of natural respiration. More usually it is between five and ten minutes. If artificial respiration is not carried on during this interval, the heart will, of course, fail again from asphyxia. It is therefore imperative that artificial respiration should be kept up after the heart has begun beating again and until normal respiration begins."

The atropine is used to prevent vagal inhibition. He found in his experimental work that, "often after the first gasp or two of natural respiration the heart, hitherto beating well, suddenly ceased beating and could not be restored even by massage. In casting about for an explanation, the only one that suggested itself—and it is not entirely satisfactory—is this: After stoppage of the circulation for several minutes the central nervous system is paralyzed. The centers recover when the circulation is resumed and the blood aerated. When the respiratory center recovers, probably other medullary centers recover somewhat about the same time. It is conceivable that when the respiratory center commences to function there is a sudden and excessive discharge of vagal impulse which stops the heart."

The question of "time" is explained by Gunn as the necessity of starting the heart sufficiently soon that the other tissues have not meantime been rendered incapable of recovery by stoppage of the circulation. So far as is known, it is the cells of the central nervous system that are most susceptible to stoppage of the circulation, so that, from the practical point of view, the circulation must be started before the cells of the central nervous system are irretrievably damaged. The current opinion is that after complete stoppage of the circulation for about fifteen minutes the cortical cells cannot be revived. While his experiments have also pointed to this conclusion, he is not convinced that it is true; and, he believes that some day it will be shown that even the cortical cells can survive arrest of the circulation for a much longer period. What is known is that they are difficult to revive. It is not proved that they are dead.

After reviewing this paper, another article came to hand by Levy¹ who thinks that the work of Gunn needs to be expanded, inasmuch as he does not deal with primary cardiac syncope. Levy states that the term "massage" is a misnomer; it is not massage of the muscular tissue of the heart which is required, but a rhythmical compression of the heart efficient in expelling, with fair force, the contents of both ventricles; the right ventricle must be compressed as well as the left. For this reason, he prefers the procedure of Bost and Neve² which briefly is as

¹ Lancet, 1921, 2, 949.

² Lancet, 1918, 2, 552. See PROGRESSIVE MEDICINE, March, 1919, p. 116.

follows: An abdominal incision is made, and through this the attachments of the diaphragm to the left costal margin are cut for 2 inches. The right hand is inserted into the left pleural cavity and the heart grasped outside the pericardium. During massage the parts are pressed around the right wrist to prevent air entering the pleural cavity.

Levy differs from Gunn in believing that the rate of compression should not be much less than that of the natural beat. He agrees with Gunn as to the "limit of interval" and the reasons therefore, and particularly as to the necessity for artificial respiration and urges the use of a mechanical appliance. While the endotracheal insufflation apparatus is preferable, I believe that the more accessible "lung motor" or "pulmotor" would be satisfactory. Levy distinguishes between "syncope from overdosage" and "primary cardiac syncope," the latter being due to the onset of ventricular fibrillation in the course of full activity. Levy lays some stress on the fact that ventricular fibrillation is not necessarily fatal, hence the measure of success in cardiac massage. He does not believe that adrenalin exerts any beneficial effect upon a heart overdosed with chloroform, and hence cannot subscribe to Gunn's recommendation to inject this drug into the jugular vein before commencing massage as it cannot enter the coronary circulation unless the heart is beating, in which case it is not wanted.

Finally, Levy gives the following rules for the performance of cardiac massage in chloroform syncope: "(a) In syncope from overdosage. Partial inversion and immediate artificial respiration by Sylvester's method. If recovery does not occur within three minutes, artificial respiration alone is not likely to avail. Proceed after three minutes to perform intrathoracic massage with perfusion of the lungs. (b) In syncope from primary cardiac syncope. Partial inversion for two minutes (with artificial respiration if the diagnosis is not quite certain). If spontaneous recovery does not occur within two minutes, proceed at once to intrathoracic massage, with perfusion of the lungs. (c) In the interest of the nerve centers, cardiac massage should be commenced within five minutes of syncope. (d) Success depends upon proper access to, and the efficient compression of, both ventricles, and an efficient system of artificial respiration. (e) If continued rhythmic compression is not successful in five minutes, it should be intermitted for periods of up to forty-five seconds' duration. (f) Massage should be continued, if necessary, up to one hour's duration before abandoning the case. (g) It is advisable to rely throughout on massage alone and discard the use of drugs. (h) If the circulation is feeble after recovery, an intravenous injection of pituitrin is desirable."

Intracardial Injections. Mention has been made above of the value of adrenalin in "arrest of the heart" and last year I presented a rather extensive review of the recent papers on this subject. Three German writers, Guthman,¹ Frenzel,² Vogt³ have called attention to the use of intracardiac injections. Guthman states that hitherto no life has been saved by this method, although Doerner reports that in one case he was

¹ München. med. Wehnschr., 1921, 68, 729.

² Ibid., p. 730.

³ Ibid., p. 732.

able to keep a patient alive for five hours. He believes that the injections failed to produce a therapeutic effect and hence he adds strophanthin (1 cc plus 1 cc adrenalin). But Vogt states that strophanthin may badly damage the myocardium and should never be given. This author prefers to inject into the ventricle and states that it should be given within ten minutes after cardiac standstill. Contrary to Guthman, he states that there are 15 successful cases on record, although not all of these patients permanently recovered. He makes the injection in the fourth or fifth intercostal space and close to the sternal edge. The heart muscle is pierced for about 4 or 5 mm. and until blood is aspirated; the pendulum swing of the needle denotes that the heart has been entered. He uses 1 cc of a 1 per cent solution of adrenalin (maximal dose 1 cmm.) Frenzel speaks of 5 permanently favorable results after intracardiac injections of adrenalin, 1 of which was from his own experience. He states that if artificial breathing and heart massage fail after three minutes to revive the patient, an intracardiac injection of 1 mg. of adrenalin should be given while other resuscitative measures are continued. He prefers the fourth interspace and enters the needle to a depth of $3\frac{1}{2}$ to $4\frac{1}{2}$ cm.

In England, Walker,¹ Whale,² Burrige³ and Kidd⁴ have written short notes on the use of adrenalin by injection into the heart muscle. Burrige warns of the depressor action of large doses and suggests a concentration of 1 to 500,000. Kidd suggests that as acupuncture of the cardiac muscle produces powerful cardiac contractions this, and not the adrenalin, may be the remedial agent.

Surgery in Pericarditis. Operation for suppurative pericarditis is rarely performed sufficiently early nor is it as frequently done as the common occurrence of the pericarditis would indicate. Pool⁵ has added 13 cases to those collected by Rhodes in 1915, a total of 99 cases, with 53 recoveries and 46 deaths. Last year I referred briefly to the technical procedures involved and to Pool's method. He found that resection of a single cartilage, preferably the sixth, is not adequate for prolonged drainage. The relatively narrow tract rapidly contracts. It cannot be kept open with a rigid tube, as in an empyema, on account of contact of the tube with the heart. If the case does not do well and a deep accumulation of pus is suspected, exploration and reintroduction of a drain is difficult and necessitates some traumatism to the heart. Accordingly, it was decided to make a more extensive exposure. "The incision begins at the middle of the sternum at the level of the lower margin of the fourth costal cartilage; curving it passes downward and to the left to the upper margin of the chondrosternal junction of the fifth; then downward close to the left edge of the sternum, crossing the fifth and sixth cartilages to the middle of the seventh cartilage; curving outward, it follows the seventh cartilage. The soft parts are freed and retracted, the resulting wound being an ellipse. The seventh costal cartilage is divided at the sternum. The soft parts are detached along its borders and the cartilage is lifted.

¹ British Medical Journal, 1921, **1**, 47.

³ Ibid.

⁵ Annals of Surgery, 1921, **73**, 393.

² Ibid., p. 137.

⁴ Ibid.

It is easily freed from the perichondrium posteriorly. A complete subchondral resection is not attempted because the perichondrium anteriorly and at the borders is firmly adherent and is separated with difficulty. The cartilage is fractured about two inches from its sternal end and removed. The same procedure is carried out with the sixth and fifth cartilages. The thin layer, including internal intercostal muscles and posterior perichondrium, is incised vertically and easily separated from the underlying tissues. This exposes the internal mammary vessels. At the upper part of the wound they lie about one-half inch from sternum. They should be ligated above and below to lessen the danger of secondary hemorrhage. The thin triangularis sterni is separated from the sternum, and with finger or blunt scissors the underlying fat, and with it the edge of the pleura, is displaced outward. The pericardium is thus exposed and is opened between forceps, about 1 cm. from the edge of the sternum. The incision should extend downward to the reflection of pericardium to the diaphragm. While the incision is in general vertical, it is advisable that it be slightly curved with concavity toward the sternum. This allows better separation of the edges and favors drainage. If possible, the edges of the pericardium should be sutured to the skin or superficial soft parts to diminish the danger of mediastinitis."

In the discussion on this paper, I¹ reported my experience in a single case. Recently, opportunity was offered to operate on a second case which was done by the method of Pool, and the institution of the Carrel-Dakin technic immediately. The boy so far has done well but is still draining from a much distended sac. The case will be reported in detail later.

An interesting paper on *Pericarditis in Childhood* has been written by Poynton.² Its point of view is more medical than surgical but he makes certain observations on the surgical aspects of the rheumatic, pneumococcic and tuberculous pericarditis. He states, "We have two alternatives. We can explore with a trocar and cannula, or we can open the pericardium. For a decision on this question we need all our judgment, which will be based upon a complete review of the case. A rheumatic effusion is often serofibrinous and difficult to drain through a cannula. Another point for consideration is that of anesthesia. Upon this I can say from my experience that though these children are desperately ill, I have been much encouraged by the ease with which a skilled anesthetist has managed them. There must be a risk, but I have never yet seen any mishap, even in the worst cases.

As a general rule, I prefer to use drainage of the pericardium rather than to trust paracentesis, and aim at making the diagnosis sufficiently sure to justify immediate recourse to opening the pericardium. Individual cases in which there is good reason to believe the fluid is serous, or in which immediate relief by the simplest method is urgent, will be excepted from such a general rule."

¹ See PROGRESSIVE MEDICINE, March, 1916, p. 121.

² British Medical Journal, 1921, 2, 583.

Trocar Drainage of Purulent Pericarditis. Believing that the recumbent position prevents adequate drainage of the posterior sulcus, Whittemore¹ suggests a closed suction technic and reports a successful case. During the first twenty-four hours, 1200 cc of pus was removed; in four weeks the catheter was removed. In eight weeks the boy was out of bed. His technic is as follows: "Under local anesthesia (novocaine, 1 per cent) an incision about three-fourths of an inch long is made in the fifth interspace, just inside the border of dullness. The muscles, pericardium and pleura, if there is any, are anesthetized. The pericardium is extremely sensitive, and it is necessary to use a considerable amount of novocaine. A long trocar with cannula large enough to admit a No. 10 French catheter is pushed through the pericardial wall. It is necessary to have a fairly sharp trocar and one must use considerable force in going through. One must use much more force than in going through the pleura. The pericardium will give in front of the trocar, the trocar tending to push it away rather than to go through it easily and therefore one must use a sharp trocar. Having gotten into the cavity with the trocar, a No. 10 French catheter that has been shut off with a hemostate is quickly slipped through the cannula. The catheter is then pushed in a long distance; far enough to allow the tip to go around the apex of the heart and then halfway up to the base. In my case this was between 8 and 9 inches from the skin. The catheter is sewed in tightly. Suction is made with a large glass syringe and no air allowed to enter the pericardium at any time. The pus can be emptied out slowly. Suction is done every one to two hours for the first twenty-four hours and then every two hours until the amount obtained at each time is only 3 or 4 cc. Then the time is lengthened to three or four hours, and, finally, to twice only during the twenty-four hours. When the amount in twenty-four hours is only 1 to 2 cc and this amount does not increase for four days, then the catheter is removed."

Routes of Access to the Heart. Last year I referred to the masterly essay by Matas in the fifth volume of Keen's Surgery. Since then the seventh volume has appeared and contains a chapter by the same author on the "Military Surgery of the Vascular System," which is a masterpiece. In this will be found a full discussion of the important problem involved in properly exposing the heart for the relief of lesions such as was outlined by Rehn,² in 1914, *viz.*: (1) In all heart wounds; (2) in the freeing of the heart from (a) pericardial adhesions of childhood, (b) in sclerogenic mediastino-pericarditis, (c) certain malformations of the chest, (d) in resection of the pericardium followed by a plastic operation with fat flap to prevent the recurrence of synechia, (e) in chronic pericardial tuberculosis.

In 1897, Milton proposed total median sternotomy, and Rehn modified this by cross-sectioning the sternum on a line with the third costal cartilage in order to allow the two sternal halves to be properly retracted. Recently, as told last year in this review, Duval and Barastý described a further modification and termed the method

¹ Surgery, Gynecology and Obstetrics, 1921, **32**, 371.

² Transactions of the American Surgical Association, 1914, **32**, 697.

"Median Thoraco-abdominal Pericardiotomy." Matas¹ describes the operation so well that I am reproducing his description. "(1) A median incision from the level of the third costal cartilage to a point in the linea alba, midway between the tip of the xyphoid cartilage and the umbilicus. After cutting the skin to the sternum, the incision is carried through the abdominal aponeurosis and between the recti, down to, but not through, the peritoneum. (2) The upper insertions of both recti are detached from the edge of the ensiform cartilage, exactly through the median line and the posterior surface of the ensiform, the attachments of the diaphragm also being cut away from the cartilage. (3) Two fingers of the left hand are inserted and pushed from below upward and behind the xyphoid, and then behind the sternum up to the level of the third costal cartilage, the fingers closely following the posterior surface of the bone. In this way the pericardium is detached from the retrosternal connective tissue. By separating the fingers slightly, the two pleural cul-de-sacs are pushed away from the mid-line and laterally to the under surface of the costal cartilages. (4) The sternum is then split in the mid-line with a large chisel (Matas prefers the giant sternotome of Hudson, which does better and quicker work) beginning from the tip of the xyphoid and ending on a level with the third costal cartilage. At this level a transverse section of the sternum is made, leaving the manubrium attached to the clavicle and to the first and second costal cartilages. (5) The two halves of the sternum are now spread open, lifted, and bent out with retractors (the hands of assistants are preferable), care being taken not to fracture the cartilages. Through this large vertical space the pleural cul-de-sac and pericardium are recognized, displaced and detached from the thoracic wall with gentle gauze pressure to avoid any tearing of the pleura. (6) Laparotomy and pericardiotomy; the peritoneum is now opened in the mid-line. By inclining the incision a little to the left and immediately along the insertion of the diaphragm to the chest wall, the pleura will be seen to diverge, leaving a very considerable and safe interspace between them. The pericardium is now held up with two forceps and divided in the mid-line with straight, sharp, but blunt pointed scissors; the pericardium is now split its full length to the root of the great vessels. The pleural cul-de-sacs are now safe and need not be considered. (7) Section of the diaphragm. Between the pericardial and peritoneal sacs, the diaphragm still remains as a horizontal partition holding the two halves of the divided xyphoid in place. The scissors are again introduced and the diaphragm is divided up to the level of the suspensory ligament. The sternal halves are then pulled apart and by lifting them up and bending them outward upon their cartilaginous attachments, they widely open the retrosternal space.

"The operation is concluded by the suture of the diaphragm, then of the abdominal incision and of the pericardium. The sternal halves are replaced and held in contact by aponeurotic sutures without bone suture support. Finally, a continuous or interrupted suture closes the skin without drainage."

¹ Medical Record, 1921, 99, 595.

This method gives perfect access and is no more dangerous than the method of Delorm which is used by LeFort. It is best adapted to patients in excellent condition and should not be attempted in emergencies, particularly gunshot injuries involving the pleura as well as the heart in which case the intercostal incision of Spangaro is best.

A modification of the Duval-Barnsby-Barasty method has been proposed by Constantine.¹ He outlines a flap incision starting at the eighth rib, extending to the xiphoid, thence up the median line of the sternum somewhat obliquely to the right second interspace, then to the left along the second left interspace for a distance of three finger breadths. The abdomen is opened and the diaphragm detached from the sternum; the latter is carefully cut upward somewhat to the right of the median line to the right second cartilage then transversely to the left second interspace. The opening is then sprung open by a Tuffier retractor. He claims that the method enables extensive exposure of the heart without exposing the pleural cul-de-sac.

Tuberculous Pericarditis. After writing the foregoing section, I wondered whether it would ever be necessary to open the pericardium for tuberculosis. A few days later the Mayo clinic number of the *Surgical Clinics* came to hand with an article by Hedblom² on this very subject. He collects 8 cases from the literature primarily involving the pericardium and adds a case observed. The clinical diagnosis was based on the chronicity, the recurrence of effusion after three aspirations, the history of recent exposure to tuberculous infection, and the absence of any other recognizable disease condition. The presence of a relatively large sterile effusion was also regarded as suggestive. The effusion was 2000 cc in amount as aspirated. Hedblom observes that the effusion may be serosanguineous in the early stage, or it may be unmixed with blood, and rarely it is purulent from the onset. The blood is believed to come from the capillaries that appear in the organization of successive layers of fibrinous deposits (Virchow); in some cases it may come from ulceration of the visceral pericardium. In his case the pericardium was explored and closed, but about ten weeks later it was necessary to reoperate for the recurrence of symptoms and again 2000 cc of seropurulent fluid was evacuated. The parietal pericardium and heart were covered with a whitish fibrinous membrane about 8 mm. thick, and the pericardium itself was about 4 mm. thick. Repeated observations during the evacuation of fluid showed no change in blood-pressure. The wound in the skin and subcutaneous tissues was completely closed by suture, but the pericardial incision, about 2.5 cm. long, was left open for dependent subcutaneous drainage. It was necessary to aspirate again about four weeks later, and the patient left the hospital shortly after this, but Hedblom thought that the outlook for recovery seemed rather poor.

Hedblom suggests that an alternative method might be used, namely, the injection of air into the pericardium following exploration of the fluid. This method of treatment seems to offer the possible advantage

¹ *Presse Médicale*, 1921, **29**, 483.

² *Surgical Clinics of North America*, 1921, **1**, 1411.

of limiting the tuberculous exudate to the pericardial cavity, and is a prevention of later adhesive pericarditis. On the other hand, argument has been raised that the open operation mobilizing the chest wall by rib and cartilage resection, while not preventing adhesions, may nullify their possible harmful effect.

Experimental Surgery of the Heart. I cannot refrain from adding a short note on a paper by Carrel¹ on the *Remote Results of Operations on the Pulmonary Orifice*. In 1913, an attempt was made to develop a technic by which the size of the pulmonary orifice of the heart could be increased or decreased. The immediate results of the experiments showed that plastic operations on the wall of the pulmonary artery and its sigmoid valves caused little danger to the life of the animal, when a proper procedure was employed. Eight animals died from one to six years after operation, from undetermined diseases or from pneumonia. Two animals are still alive seven years after the operation. In spite of the careful technic developed by Carrel, a certain degree of adhesion formation was found, which he believes indicates the necessity for further perfection in the procedure of handling the viscera. If adhesions follow after the meticulous attention to detail practiced by Carrel, how much more likely are they to result after the rough handling of delicate surfaces by the average surgeon. The experiments consisted of incisions and patching of the pulmonary orifice, and cauterization and suture of the sigmoid valve. Technically, the procedures were successful.

THE LUNGS AND PLEURA.

Wounds. Nothing so well illustrates the passing of time as the paucity of literature on this section of chest surgery—a bare one-half dozen articles appear in the literature of the year. Shipley² reports on 190 chest injuries treated at Evacuation Hospital No. 8 during the Argonne offensive. Of these, 25 died in the shock ward unoperated because they could not be gotten in condition to warrant operation. Forty-three had a major thoracotomy done, with some operation upon the lung. One of these had a wound of the pericardium as well. In this group, there were 27 deaths—63 per cent mortality. Forty had extensive chest wall débridement, often with the pleura open, but no operation was done on the lung. There were 16 deaths in this group—a mortality of 40 per cent. Many of these wounds had been sucking ones. The next group were not operated. They were composed of penetrating or perforating bullet wounds, or penetrating wounds made by smaller pieces of shell casing. There were 82 in this group, with 7 deaths—a mortality of 8.5 per cent.

In the Lettsomian Lecture for 1921, Gask³ presents this subject very clearly. He believes that it is probable that not less than one-third of those killed in the field had been shot in the chest. When one considers that the chest roughly is one-third of the target offered, it is probable

¹ Journal of Experimental Medicine, 1921, **34**, 441.

² American Journal of Surgery, 1921, **35**, 221.

³ Lancet, 1921, **1**, 1223.

that this figure is approximately correct. He also thinks it is clear that about 30 per cent of those surviving the battlefield subsequently died as the result of their wounds. "These figures make one wonder whether the question of the provision of some form of protective armor for the chest should not be considered."

WOUND PNEUMOTHORAX. Gask makes an earnest plea that the lessons of the war be turned to good account. He says, "Now that danger from sepsis has been eliminated, the surgeon's only real dread is the danger of producing a pneumothorax. It is essential carefully to consider this point. In order to do clean, efficient work inside the thorax, it is absolutely necessary, just as when dealing with the abdomen, to have a good exposure; a wide opening of the pleural cavity, or mediastinum, therefore becomes a *sine qua non*. The question may then be asked as to whether such a wide opening either kills the patient or causes serious respiratory disturbance; the answer is that during the war many hundreds of chests were opened without fatality or serious disturbance to the patient; and, moreover, that manipulation of the thoracic viscera was made without causing serious shock. If that can be done in military practice, why can it not be done in civil surgery? Or can the method be improved upon?"

He discusses the positive pressure chamber, endotracheal insufflation and the face-mask method, and prefers the second of these. In the discussion on this subject at the meeting of the American Association for Thoracic Surgery in 1920, Heuer¹ stated that "they had no special anesthetist, and had no intrathoracic pressure anesthesia apparatus. Under the circumstances they used ether by the drop method in operations upon the thorax. In 160 cases of penetrating chest wounds, there were 45 with open sucking chest wounds in which immediate operation was performed without a pressure apparatus. In not a single case was there disturbed respiration during the course of operation. There was no death upon the operating table, no death afterward which could be ascribed to their method of giving anesthesia. They came to feel, therefore, that thoracic surgery could be done without fear of respiratory upsets without the use of the pressure apparatus." Green, however, believed in the necessity for mechanical measures to maintain artificial respiration and that "one should develop a vision for the future of thoracic surgery and do nothing to discourage the attempts now being made along these lines." Graham,² also says, "Despite, however, the remarkable operative results which have been obtained, often with an apparently complete neglect of the dangers of an open pneumothorax, nevertheless its inherent danger as a cause of fatal asphyxia in some cases remains, and will continue to remain if steps are not taken to avoid it."

Endotracheal Insufflation. In the paper written by Jacobaeus and Key³ on intrathoracic tumors; I note a few paragraphs bearing on this point which seem of special interest. They state that, using the Elsberg

¹ Medical Record, 1921, p. 627.

² Annals of Surgery, 1921, 33, 170.

³ Loc. cit.

apparatus, they were unable to inflate the lung by raising the pressure at the end of the operation in 2 cases. They discussed the matter of the degree of pressure and the size of the catheter variously recommended by different writers, and then conducted a series of experiments to determine the standard. These experiments were done on the lungs from newly killed calves, with the following result:

1. With the same position of the catheters a considerably higher pressure is needed to expand the lungs by use of a small catheter than by a coarse one.

2. With the same position of the catheter and by the same pressure of the pumped-in air the pressure in the trachea and bronchus rises with the thickness of the catheter.

3. With unchanged position and the same diameter of catheter the pressure in the trachea and bronchus rises on the whole by raising the pressure of the pumped-in air.

4. The pressure distally of the catheter opening is considerably higher than proximally of it.

5. By the same pressure of the pumped-in air and with the same size of catheter the pressure in the bronchus rises the further the tracheal catheter is introduced.

Another point brought out in this paper is that it was of advantage before an operation on the chest to induce pneumothorax, particularly if no differential pressure apparatus is at hand.

Surgical Treatment of Tuberculosis. Last year I devoted considerable space to this subject and at this time will only bring out a few points which seem of special interest. As is well known, the principle measures at our command are the simple, and in a sense the non-surgical, method of nitrogen replacement, and the extensive radical procedure of thoracoplasty. Last year I presented a brief abstract of the paper by Saugman on *Artificial Pneumothorax* in which he stated that when the operation was "technically successful," 32 per cent of the cases were successfully treated, whereas when the procedure was a failure technically, only 10.9 per cent were able to work. If we refer to Saugman's paper again we find that the cause of the technical failure was the presence of adhesions. Peers¹ found that in a series of 91 consecutive cases, 25, or 27.5 per cent, could not be compressed at all because of adhesions, and 32 cases, or 35.1 per cent, could only be partly compressed.

Of course, the main facts involved in the above statements are well known to those especially interested in this subject. Gravesen² has worked up Saugman's statistics and shows how the results point to the sinister importance of adhesions, and to the need to investigate every means by which they can be obviated, or to promote the factors determining the successes of adhesion-free cases. He says that only after attempts to induce a pneumothorax have failed, or a partial pneumothorax has been established for some time, can the extent and distribution of pleural adhesions be accurately ascertained. Even when a pneumothorax has been successfully induced, a few adhesions may determine

¹ California State Journal of Medicine, 1921, 19, 316.

² Tubercle, 1921, 2, 395.

the subsequent course of the case. Their presence is suggested by the absence of permanent improvement. Examination by the stethoscope and x-rays often fail to give a clear impression of a complicated network of adhesions. Therefore, the method devised by Jacobaeus, to a large extent unknown to most of us until the last year, is well worth describing in detail.

THORACOSCOPY AND CAUTERIZATION OF ADHESIONS. In 1913, Jacobaeus first described his method of cauterizing the adhesions which prevent the complete collapse of the lung in the pneumothorax treatment of pulmonary tuberculosis. Full descriptions of technic and case reports are given in the later publications of Jacobaeus;¹ Holmboe² and Gravesen.³ Briefly, the method aims to so treat the unfavorable case from the standpoint of artificial pneumothorax by reason of adhesions and to convert it into the favorable class by dividing these adhesions. I heard Professor Jacobaeus deliver the Mutter Lecture before the College of Physicians in Philadelphia, and saw the numerous illustrations of the x-ray pictures made before and after treatment, and the demonstration was very convincing. The technic is probably very difficult, and, as Jacobaeus well says, careful practice is required before adhesions can be cauterized with success. He uses a thoracoscope which embodies the principle of the cystoscope and which is introduced by means of a cannula passed through the chest wall in the line of the scapula, in the fifth to the eighth interspace, depending upon the location of the adhesions. Of course, it is necessary first to induce a pneumothorax and to locate the adhesions roughly by means of the x-ray. Jacobaeus also says that he has found orthodiagraphy, a method introduced by Saugman, very useful in projecting the adhesions on to the anterior and posterior chest walls. Having introduced the thoracoscope, the operator studies the position and character of the adhesions, and then introduces a galvano-cautery through another cannula, usually in the middle or anterior axillary line, from the sixth to the ninth interspace. Guided by the thoracoscope, the cautery is pushed up to the adhesions and by pressure on a spring in the handle, the current is turned on and the desired heat created. The most dangerous complication of the operation is hemorrhage, but Jacobaeus states that only 6 of about 100 patients operated on by this method have had hemorrhages in any severity, and in but 1 instance was there any real danger. Hemorrhage may be avoided to a great extent by keeping the cautery at a dull glow. Should a hemorrhage occur which cannot be controlled by the cautery, pressure by means of air or salt solution should be employed. Certain minor mishaps may result, such as emphysema, fever, effusion or pain.

Thoracoplasty. In his article on "*Lung Collapse Therapy in Connection with Pleural Adhesions*," Gravesen⁴ states that "at present the choice of treatment in such cases seems to lie between intrapleural cauterization of band-shaped adhesions under thoracoscopic control

¹ Surgery, Gynecology and Obstetrics, 1921, **32**, 493; Acta Chir. Scand., 1921, **53**, 293 and Deutsch. med. Wchnschr., 1921, **37**, 702.

² Tubercle, 1919, **1**, 1.

³ Loc. cit.

⁴ Loc. cit.

and extrapleural thoracoplasty." The former is preferable, but, if technically impossible, pneumothorax treatment should be abandoned in favor of thoracoplasty. Gravesen is first assistant to Professor Saugman in Copenhagen. Saugman himself¹ says that the indications for thoracoplasty are mainly the same as those for pneumothorax treatment, no patient being operated on in whom a pneumothorax has not been previously tried. The cases selected therefore were (1) severe, chiefly unilateral, cases of pulmonary tuberculosis, which were found to be incurable, either by general sanatorium treatment, or by subsequent subsidiary methods; and (2) such patients as from the outset may be regarded as curable with difficulty or incurable by general means unless treatment be prolonged. I think that most of us have believed that these procedures were only applicable to the unilateral lesion, and it is interesting therefore to record that in the more than 400 patients in whom Saugman induced or tried to induce a pneumothorax, in no case has there been an absolutely unilateral effect. He regards operation contra-indicated by severe tuberculous diseases outside the air passages, and by other severe disease which of itself threatens the patient's life, particularly debility of the heart. Insofar as I can make out from Saugman's paper, he allows no complication in the chest itself to interfere with operation. He always induces artificial pneumothorax first and then apparently advocates thoracoplasty in all cases not suitable for a continuation of this method of treatment. Even when both lungs are involved, he operates, believing that the favorable effect on the "better" lung is due to the formation of antitoxins in the compressed and immobilized lung or pleura rather than the ridding of the patient of toxin by compression of the operated lung. I notice that Sauerbruch² advised section of the phrenic nerve as a diagnostic measure to ascertain whether the other lung would be able to withstand further burdens. He advises against thoracoplasty when, after section of the nerve, there is fever and an increase of physical findings on the opposite side.

TECHNIC OF THORACOPLASTY. Saugman strongly advises local anesthesia, with 1 per cent solution of novocaine-suprarenin. All the intercostal nerves in the sphere of operation are anesthetized by injections close to the angle where each nerve passes into the sulcus intercostalis. The main difficulty will occur with the upper ribs, especially with the first, which is often hidden so deeply under the second rib as to be hardly reached until the ribs are bared. As the stripping of the periosteum is usually painful, another injection is given in the bared intercostal space. He particularly favors local anesthesia when the operation is not done under differential pressure methods because the patient is able by coughing to avoid aspiration of expectoration or secretion. I judge by a statement made by Gravesen that they prefer to complete the operation in one stage, if the patient's general condition and the state of the other lung permit. This also seems to be the position taken by Sauerbruch. On the other hand, Bull³ stated that he had

¹ *Tubercle*, 1920, **1**, 305.

² *München. med. Wehnschr.*, 1921, **68**, 261.

³ *Lancet*, 1920, **2**, 778.

reduced his mortality of 30 per cent to 4 per cent by operating in two stages. The trouble with the two-stage operation is that considerable difficulties may be experienced owing to the formation of scar tissue. Furthermore, Gravesen states that the scapula seems to adapt itself better to the altered conditions of the chest wall and to act more satisfactorily as a *pellotte* when the operation is performed in one stage instead of two. Gravesen states that if the operation is performed in two stages, it is essential that the lowest ribs should be resected first, even when the disease is mainly apical, for primary collapse of the upper part of the lung involves grave risks of aspiration into the lower lobe. For the same reason, a partial thoracoplastic operation confined to the upper part of the chest should be avoided unless the lower lobe is already compressed by a partial pneumothorax. Saugman practices an operation similar to that of Sauerbruch and advises the removal of the first rib in all cases. He states that, in spite of the best possible anesthesia, total thoracoplasty is very exhausting and must be quickly performed. He has usually been able to complete it in thirty to forty minutes. If done in two stages, the first can be performed in twenty to thirty minutes, but the second stage takes a little longer.

The result of the operation is a very considerable diminution of the half of the thorax concerned, as much as one-third or one-half of the other side. The dome of the apex is lowered, and the diaphragm considerably raised. Some of this may be counterbalanced by the convex scoliosis usually developed after operation. Cough and expectoration are soon markedly diminished and in many cases disappear. In 13 out of 24 cases tubercle bacilli permanently disappeared, and usually in a few months the diminution of the number of bacilli is very marked. In several cases hemoptyses seemed eased although 1 patient developed a fatal hemoptysis seventeen days after operation. Seven of 12 cases became afebrile. Auscultation reveals the presence of persisting rales due to the fact that compression usually is not complete and air containing active lung tissue remains here and there, often with bronchiectatic cavities incompletely compressed, and still secreting. Saugman states that from stethoscopy alone one cannot form an opinion of the state of the lungs and I believe that herein lies the secret of the failures, the operation having failed to effect sufficient compression. Gravesen states that in several cases they have observed definite reaction probably due to the sudden collapse of the lung which entails flushing of the organism with toxin. Thus, an exacerbation of the lesion in the other lung results from this "tuberculin-overdosage." He states, however, that this exacerbation does not, as a rule, lead to permanent consequences, and that, on the whole, the outlook for the remaining lung is improved by the operation. Among the first 60 cases there were 6 operative deaths, 1 each from embolism of the pulmonary artery, novocaine-suprarenin intolerance, postoperative tetanus, respiratory insufficiency (mediastinal "flutter") shock (a case of prolonged empyema) and pneumonia following general anesthesia. Of the surviving 54 patients, 7 achieved "relative recovery." They were symptom-free and have been fully fit for work at least a year; in 16 there was marked improvement, and it is

expected that members of this group will be gradually added to the first. In 17 cases there was improvement, in 1 there was no noticeable change, and in 11 cases the patients became worse in spite of the operation and have since died. Two patients were markedly improved, but died of influenza. Thus, in 42 cases, a positive result, and in 18 a negative result was obtained. All of the 60 cases were sputum-positive before the operation, 31 becoming negative; 25 cases were febrile, and of these 14 became afebrile. Gravesen states, finally, that much importance is attached to the provision that the operation is, in every case, carried out in a sanatorium so that the patient does not for a moment discontinue ordinary sanatorium treatment. In connection with these results, we might also mention that Sauerbruch claims 35 per cent of cures and 40 per cent of improvements in 381 patients operated on. The immediate mortality was only 2 per cent.

Last year I quoted a successful case operated on by Willy Meyer. Another case has been reported by Whittimore and Chaffin.¹ Sections of the first to eleventh ribs were excised from below upward measuring from 2 to 11½ cm. under local anesthesia. The patient improved rapidly and had gained ten pounds upon discharge from the hospital. He then entered a sanatorium and in two months had gained another ten pounds. Six months after operation he returned to work but began to lose weight and had two attacks of hemoptysis. He again began hygienic treatment at home and was reported to be rather rapidly improving again. One might comment upon the feeble showing made by American surgeons in this field as compared particularly with those in the Scandinavian countries and Germany.

Before leaving this subject, I think it would be well to quote from Riviere.² He says, "with regard to all these surgical procedures, it must be noted that operations are not to be lightly undertaken in the subjects of pulmonary tuberculosis; the cases require even more careful selection, especially as regards the condition of the better lung than they do for mere pneumothorax treatment." He also states that while the indications for pneumothorax treatment are within narrow limits, yet within these limits all is possible to a case of unilateral or practically unilateral disease, if only we are sufficiently persistent. "The patient with one lung has a good fighting chance if only our skill and resourcefulness suffice to discover for him the road to victory."

Artificial Pneumothorax in Fractured Ribs. Soresi³ suggests the use of artificial pneumothorax in the treatment of fractured ribs, which seems a new application of artificial pneumothorax. In fractured ribs it is a common practice to strap the patient with adhesive plaster, so that the chest is put at rest and the patient saved from the often excruciating pain caused by the movement of the fractured ribs. However, it is evident that when there is a complete fracture of the rib, Soresi believes that such strapping may be ineffectual, but also may be dangerous and later cause deformation of the chest.

¹ Boston Medical and Surgical Journal, 1921, 185, 250.

² British Medical Journal, 1921, 1, 810.

³ Journal of the American Medical Association, 1921, 76, 379.

If there is no injury of the lungs or of the pleura, the best manner to prevent expansion of the chest would be by resorting to artificial pneumothorax, which obviously puts the affected thorax at complete rest. He has used this means in one case in which the sixth, seventh, and eighth ribs were broken, and strapping had not relieved pain. Immediately after the application of the artificial pneumothorax, the patient felt absolutely comfortable and remained so. Injections of nitrogen were repeated three times.

X-rays and Pneumothorax in the Diagnosis of Intrathoracic Tumors. The most common tumor in the chest is the metastatic carcinoma of the lung, especially secondary to cancer of the breast. For an excellent article on this subject the reader is referred to that by Pfahler¹ published in 1920. Knox² has also contributed an excellent article easily accessible to which is added in the discussion a very succinct description by Black. At present, I am concerned with certain tumors of the lung or pleura which may be diagnosed by artificial pneumothorax plus the x-rays. Fishberg³ reports some cases and believes that his roentgenograms are the first that show the tumors clearly. But the best article on this subject is that by Jacobaeus and Key⁴ who give a brief bibliography. When Jacobaeus lectured in Philadelphia last November I was much impressed by the value of this method. Five cases are detailed, in each instance being followed by very interesting comment (*epicrisis*). Jacobaeus combines thoracoscopy with the other methods and while this may be a step in technic beyond most of us, yet the evidence points clearly to the great value of an x-ray study plus a pneumothorax and x-ray picture.

Empyema. This still seems the topic of greatest interest to the majority of writers on chest surgery. From the large number of papers I can only select, here and there, a few that seem to contain points of greatest value to those who do not closely follow the literature. Acute empyema was one of the subjects up for discussion before the British Medical Association last year. The opening paper was read by Wade⁵ and is disappointing in that it does not take a decided stand upon any of the moot points in technic now occupying the minds of surgeons. Apparently, Wade has been impressed by the recent writings of a conservative character, as the following conclusions would indicate:

1. A combined cytological and bacteriological examination of the fluid withdrawn should be more widely employed, as offering the prospects of affording fuller and more accurate data on which to found our operative treatment.

2. Suppuration within the pleural cavity is especially suitable for treatment by methods which obviate the necessity for opening the chest, or by methods where an immediate or early closure after it has been opened are carried out.

¹ Annals of Surgery, 1920, **71**, 472.

² British Medical Journal, 1920, **2**, 392.

³ Journal of the American Medical Association, 1921, **76**, 581.

⁴ Acta Chir. Scan., 1921, **53**, 573.

⁵ British Medical Journal, 1920, **2**, 385.

3. The value of the treatment by aspiration alone should be again carefully reviewed.

4. The value of methods in which, after aspirating the content, an antiseptic is introduced, such as Murphy's method, in which 2 per cent formalin in glycerin is introduced, should be further considered.

5. When simple drainage is practised, the ideal opening is not only one which allows free escape of the purulent content at the time, as when a rib is resected, but it should also be such as will readily seal itself off when the tube is withdrawn, as when minor intercostal thoracotomy is performed.

6. The benefits to be derived from a free opening of the pleural cavity by major intercostal thoracotomy warrant its employment in cases which give promise of developing into chronic and persistent cases.

7. The value of disinfection and immediate closure in these cases should be more fully tested.

8. The Rutherford Morison technic is the best at present available for carrying out the same.

In the discussion on this paper most of the speakers, to use the words of Cooke, admitted only with reticence and almost with shame that they used a tube. As to conclusion "number eight," I for one would be unwilling to fill the acute empyema cavity with "bipp" or any other paste.

The matter of aspiration seems to vex many surgeons but its indication is relatively simple, and it is hardly necessary to go over the ground again, one so ably covered by the work of the Empyema Commission. In the thin exudate of the streptococcus group, in the early thin exudate of pneumonia, especially in children, and in the very ill patient aspiration finds its field. As Matthews¹ puts it, the thinner the exudate, the more suitable the aspiration treatment and the greater are the objections to the opening of the chest wall—such as flapping of the lung and displacement of the mediastinum. When the exudate is thick and fibrinous, we expect to find a definitely lined cavity, that is, there are adhesions sticking the lung to some of its surrounding structures so as to steady the mediastinum and limit the flapping of the lung itself. I would also strongly endorse the following from Matthews: "With the knowledge that the aspiration or aspiration and injection treatments cure some cases, there is a tendency to continue the treatment too long. During the progress of a case under aspiration, the general condition may for a time very considerably improve. The patient seems not so sick and the temperature may remain only a little above normal. This, however, does not indicate necessarily that the patient is going on to recovery without a thoracotomy. The more important guide would seem to be the rapidity of recurrence of exudate. If, with subsidence of the toxic symptoms, there is not a rapid diminution in the amount and rate of formation of the exudate, one should abandon the idea of a cure by this method. If persisted in, the lung may become so fixed in the compressed position as to delay the obliteration of the cavity after thoracotomy."

¹ *Annals of Surgery*, 1921, **73**, 735.

In glancing through the literature on this subject, one is impressed with the idea that most surgeons are slowly swinging backward to the position taken before the War brought us the new antiseptics. Not that Dakin solution has been entirely abandoned, but rather that its indications have been narrowed and its limitations made known. Picking up a few of the articles at random, we note that St. John¹ states that the problem can only be solved by a knowledge of the etiological factors and pathology in each individual case and by removing the causes of "the persistent collection of pus in the pleural cavity with little, or no, tendency to heal." (Hedblom) St. John speaks of the consistent use of Dakin solution, major thoracotomy, graphic chart studies and setting-up exercises. He speaks from the experience of the First Surgical Division at Bellevue Hospital, New York. He insists upon keeping all patients under immediate care until the sinus is actually closed, and I think that this advice is a good one, because often in our desire for a reduced "average stay in the hospital," we let the patient wander away with a sinus only to develop into a chronic cavity. I notice that in a series of 40 cases his mortality was 7.5 per cent in those uncomplicated by abscess of the lung; with these additional cases included, the mortality was 12.8 per cent. From the same clinic, Hartwell² states that he is convinced that the proper use of Dakin solution, carefully safeguarded, is a very great aid toward producing a sterility of the cavity, and that, when sterility is produced, we may confidently expect (if no other complications be present) that the lung will expand to entirely fill the chest cavity and that a complete cure will result. He is speaking only of acute empyema. Hitzrot and Weeden³ note the results of the treatment of empyema in the First Surgical Division at the New York Hospital. One hundred and eleven cases were operated on, with 19 deaths, a mortality of 17.1 per cent. The essential principle followed throughout was to secure satisfactory drainage, and the site almost universally chosen was the eighth rib in the posterior axillary line. Simple thoracotomy with drainage gave a somewhat lower mortality and a slightly higher percentage of cures, but the difference was not marked. Ether was used as an anesthetic 62 times, with 9 deaths in the series (14.5 per cent), local anesthesia 14 times, with 3 deaths (21.4 per cent). The mortality in the "pneumococcus group" was 9.3 per cent; in the "streptococcus group" 13.6 per cent. Hubbard⁴ reports the cases in the Boston City Hospital during a period when the empyema patients were all referred to him. There were 35 in number, with 4 deaths (11.4 per cent). He advocates repeated aspirations, followed by "catheter drainage." The end of the catheter is clamped so that the method is a closed one for a few days. Some cases will recover with no further treatment, others will not drain properly or show evidences of absorption. These require a rib resection, which he does under gas-oxygen anesthesia. He believes that Dakin's solution by irrigation or instillation is of benefit,

¹ Surgical Clinics of North America, 1921, **1**, 481.

² *Ibid.*, p. 349.

³ Annals of Surgery, 1921, **33**, 531.

⁴ Boston Medical and Surgical Journal, 1921, **185**, 112.

but, unless the proper careful technic is carried out, this solution is no better than any other. Wynn,¹ of Indiana University, reports a series of 56 cases with a very creditable mortality of 7.1 per cent. He advocates the standard procedure of rib resection and drainage with preliminary aspiration in the very ill cases. The average postoperative hospital residence was four and a half weeks. Several excellent reviews have come out during the year, particularly those of Binnie,² Lloyd³ and Gurd.⁴ Several articles by Mozingo⁵ present his well-known "catheter method" in detail and he reports his observations on 138 cases. This method is a modern refinement of the ancient one of Bulau long ago given up but, as suggested by Binnie, it may be of value to tide over a critical period. Two of Binnie's closing sentences are "Some travelers like hilly paths while others prefer the smoother highways. Some surgeons require the stimulus of complicated methods; others prefer less complex but equally efficient means." These remarks are quoted instead of reviewing and picturing the various valves, suction apparatus, etc., which have appeared in the literature during the year.

One of the most interesting papers of the year to me is that by Wilensky.⁶ It is so compactly written that only a complete reproduction would present all of the points adequately. The kernel of the paper seems to be that Dakin's solution has but a limited use in the treatment of empyema. "The method is not feasible in the presence of any source of reinfection (insufficient drainage of any kind, osteomyelitis of the rib, etc.) in the presence of any communication with the bronchial tree, in empyemata other than the simple pyogenic varieties, in empyemata whose contour is other than the simplest, or in empyemata the mechanical conditions of which are not conducive to a reasonably prompt healing (collapsed lungs). The method is very useful in the relatively small minority of small encapsulated empyemata and which do not suffer any of the drawbacks or complications previously indicated. One cannot help but gain the impression that in the cases in which the use of Dakin's solution is satisfactory, a healing similar in all respects would be obtained without the use of this antiseptic solution if the same meticulous care were exercised in the postoperative management as is necessary according to the precepts of the method."

He arrives at this opinion by studying the various types of empyemata and the effects therein of Dakin's solution. For the purpose of the argument, it is assumed that the method is most properly and efficiently employed as far as is humanly possible (1) In simple localized empyemata, with single or multiple cavities, conditions are ideal for proper distribution of the fluid, maintenance of asepsis and avoidance of reinfection. This variety is ideally suited for sterilization, and actual practice bears out the idea. (2) Complicated cavities, either multiple, with intercommunication, or single with irregularity of contour

¹ American Journal of the Medical Sciences, 1921, **161**, 387.

² Archives of Surgery, 1921, **2**, 627.

³ Annals of Surgery, 1921, **74**, 557.

⁴ Canadian Medical Journal, 1921, **11**, 408.

⁵ American Journal of the Medical Sciences, 1921, **161**, 676, etc.

⁶ Annals of Surgery, 1921, **73**, 79.

and shelf formation interfere markedly with the proper use of the Carrel-Dakin method. The difficulty lies in securing the antiseptic effect upon the entire surface to be sterilized and in securing adequate drainage. The latter, according to our premises, is one of the obstacles to the successful employment of the method. Such complicated empyemata can heal, but experience seems to demonstrate beyond doubt that under such conditions the value of the antiseptic solution is very doubtful. (3) Wilensky believes that this group indicates (a) That the empyema was produced by a sudden rupture of some purulent focus within the lung parenchyma which permitted a free communication between the potential intrapleural space and the bronchial tree and resulted in the formation of an acute pneumothorax; the lung then immediately collapsed: (b) or because of the presence of a broncho-pulmonary fistula, the total collapse of the lung was a somewhat more gradual process due to disturbed mechanical conditions, such as described on a previous occasion. The important point is that in either case it presupposes the presence of a broncho-pulmonary fistula at some time of the history of the empyema.

The fact that the communication may not be demonstrable at any given moment does not negative the assertion that such a communication exists at the time of examination, or that it had been present at some previous time; for these fistulae may not be possible of demonstration because they are situated at some inaccessible portion of the cavity, or because they are extremely small, or because by that time they are, perhaps, even temporarily or permanently closed. (4) Empyemata, with fistulae which complicate or are complicated by pulmonary abscess. In Groups 3 and 4 the probable or certain presence of a broncho-pulmonary fistula introduces a definite source from which a constant reinfection of the empyema cavity can take place. In the face of this complication the use of any antiseptic solution does not result in any sterilizing effect.

BRONCHOPULMONARY FISTULA. Failure of the sinus in the chest wall to heal after an empyema operation is often a source of annoyance to the patient and surgeon. According to Wilensky¹ the greatest obstacle to healing is fistula even in cases in which there is no inkling of its presence. His article is most interesting and is illustrated with diagrams showing the various varieties and which apparently are an amplification of those published in his previous paper.² I will only quote his concluding paragraph regarding treatment. "In the stubborn cases no one method of operation suffices for all. The two essential methods of attack are directed toward collapsing the chest wall (thoracoplasty) or toward aiding and facilitating the expansion of the lung (pneumolysis)—both of these with the object of securing a rapid cohesion of the large opposing surfaces. The closure of the opening in the bronchial tree and the excision of the pulmonary portion of the sinus tract, when the latter is of considerable length, is itself an undertaking; frequently the success of the larger and more extensive operation, indicated above, is nullified

¹ *Annals of Surgery*, 1921, **33**, 30.

² See *PROGRESSIVE MEDICINE*, March, 1916.

by the failure of that part of the operation directed toward the closure of the fistula. In any case, one should not limit one's self with any pre-conceived intention of adhering exclusively to any one essential type of operation. In many of the cases every available type and method of operation (thoracoplasties, pneumolyses, various types of incision, etc.) ought to be considered and utilized in order to insure success." Closely related to this subject is the matter contained in the paper by Gurd.¹ He reports the observations made on 25 cases of chronic chest sinus, 11 of which followed gunshot wounds. He believes bronchial fistula to be the chief cause in only 1 case, although it was present in 5. The article mostly proceeds upon stereotype lines. On reading over his conclusions as to the cause of persisting sinus I note that the first one describes the high situation of the drainage opening which allows a puddle to accumulate below. I am reminded to include a note from a second paper by Binnie.² He states that on each side of the vertical column is a gutter which can only be drained by an opening at the angle of a rib, the patient being in the dorsal decubitus. Accordingly, he makes an opening at the level of the fifth or sixth rib and then, by means of the finger or forceps, finds the lower point for any decubitus and establishes drainage there. The primary opening may be used for the insertion of Carrel tubes, or may be left alone. Anyone interested in this particular phase of technic is referred to an article by T. Turner Thomas³ of some years ago.

GENTIAN VIOLET IN THE EMPYEMA CAVITY. In the last year there have been numerous references to the use of dyes, especially gentian violet, in closed cavities. Churchman⁴ refers to his success in the treatment of infections of joints by lavage and staining and to his suggestion that this might be applied to early infections in the thoracic cavity. He says there is no reason to suppose this treatment would be of any use in empyemas of long standing. He then describes his apparatus which he used first for joint lavage but adapted for use in empyema. He then describes the technic of joint lavage. He uses in the knee 75 to 100 cc of 1 to 1000 solution of gentian violet which distends the joint after first washing out the joint with normal saline. A good sized trocar and cannula is used for the irrigations and injection.

A series of experiments on streptococcus empyema in rabbits with certain dyestuffs chosen from among those that were found active *in vitro* or streptococcus pus from this condition, were performed by F. P. Gay and L. F. Morrison.⁵ The dyes were laparin, janus green, solid green, methylene blue, new fast green 3B, and acriflavine. In no instance was a curative effect produced. They injected more of the dye than theoretically should be necessary to sterilize the collection, but apparently there was reinfection. Acriflavine seemed to give the best results, killing a "good many organisms." Phagocytosis was inhibited

¹ Canadian Medical Journal, 1921, **11**, 408.

² Journal of the Iowa State Medical Society, 1921, **11**, 165.

³ American Journal of the Medical Sciences, 1913, **145**, 405.

⁴ Journal of the American Medical Association, 1921, **77**, 1, 24.

⁵ Journal of Infectious diseases, 1921, **28**, 1, 5.

in strong concentrations. In a number of experiments the dye has been used with, and without, aspiration, but this treatment has also failed, they say "there is little evidence that any of the dyestuffs have been used successfully in the treatment of closed cavities except in the work of Churchman."

Twenty-seven cases of empyema were treated by aspiration with a Potain aspirating outfit and the injection of 100 cc of an aqueous solution of gentian violet by means of a Luer syringe through the aspirating needle by Major.¹ One to 10,000 was first used, followed by 1 to 5000; 1 to 5000 was then followed by an increase to 1 to 1000. Of the 27 cases, 14 (51.8 per cent) were cured. Eight (29.6 per cent) later came to operation; 5 (18.5 per cent) died, 3 of these died of pneumonia present on admission, 1 of peritonitis from a diphtheritic enteritis. In the 14 successful cases, part had thick pus from the beginning, part a serofibrinous fluid; 17 cases had hemolytic streptococcus in pure culture. The number of treatments before cure varied from 1 to 38. The average was 14 to 16. If a lowered temperature did not follow treatment in fifteen to twenty days, the patient did not recover by this method of treatment, and surgical intervention was indicated.

Waters² reports 2 cases of septic infection of the pleura during the course of artificial compression of the lung in pulmonary tuberculosis treated by saline and gentian violet lavage with gratifying results. The pleura was first "washed clean" through a needle with warm normal salt, 1000 cc being used and then washed with 1 to 1000 aqueous gentian violet solution, about 150 cc of the latter being left in. In 1 case a drop in temperature resembling a crisis in pneumonia followed one treatment. The pleural irrigations and instillations were done at progressively longer intervals, using 1 to 2500 gentian violet. Both cases reported showed staphylococci and a few Gram + cocci.

He remarks on the advantage of gentian violet over most antiseptics because of its low toxicity, absence of irritation following its use, and the bacteriostatic effects from comparatively weak solution.

TUBERCULOUS EMPYEMA. Surgeons are usually in doubt as to the proper management of these cases and whether to drain the chest or not if empyema manifests itself in the tuberculous patient. Saugman believes that the practice of draining a tuberculous empyema is still all too common, and he stamps it as malpractice. There is some recent literature, however, worth quoting. Duboff³ concludes that tuberculous empyema is nearly always a sequence of lung rupture from coughing, the cavity discharging its contents into the pleural cavity. He observed 20 cases in 902 patients (2.2 per cent). The exudate is pus or sero-pus in the ordinary sense of the term, and usually contains tubercle bacilli. It exerts a temporary favorable influence on the associated pulmonary lesion and may give no symptoms for a great many months or years, although often the onset is acute. Hedblom⁴ after an analysis of the

¹ American Journal of the Medical Sciences, September, 1921, **162**, 3, 397.

² American Review of Tuberculosis, 1921, **4**, 12, 875.

³ Ibid., 1920, **3**, 590.

⁴ Annals of Surgery, 1920, **72**, 288.

cases of chronic empyema brought to the Mayo clinic, finds that while both a pulmonary lesion and a history of a preceding pleurisy with effusion are important in the differential diagnosis of a tuberculous empyema, a pleurisy with effusion is probably the more significant. A tuberculous empyema may run its course without any clinical or *x*-ray findings to suggest the condition, the typical microscopical picture in the sectioned pleura or the demonstration of the bacilli in the exudate may constitute the only evidence.

In the discussion on Hedblom's paper, before the Thoracic Association, Shere¹ stated that he divided tuberculous empyemata into three distinct classes: (1) The very acute cases, in which the onset was sudden, such as following a rupture of some part of the infected lung. These cases must not be operated on when the diagnosis was first established. Delay usually offers a better prognosis for the patient. (2) The subacute cases, wherein the exudate gave rise to dyspnea, fever, and increased cough—simple withdrawal of the pus under the most aseptic technic from time to time was the best method of treatment. (3) The chronic cases, wherein the above treatment had failed and the patient continued to be dyspneic, running a degree or two of temperature above normal and accompanied by anorexia and gradually progressive asthenia—these they operated on by rib resection and tube drainage with antiseptic irrigation until the cavity was sterile. When the latter was accomplished, they endeavored to close the cavity by means of Beck's paste or skin flap transplantation. A small number of these patients required a thoracoplasty for the complete collapse of the entire lung before a cure was finally established. All their operative work was done under spinal anesthesia, since their medical staff was opposed to the use of general anesthesia in these patients. Shere hoped to present some experimental data along these lines at some future meeting of this association, accentuating some of the points which he tried to present at this meeting.

Duboff believes that, provided there are no pressure symptoms, the patients are most comfortable and most free from toxemia when left alone. Aspiration is indicated in the presence of dyspnea, pain and irritating cough. A fine needle should be used, as the trocar and cannula is almost certain to result in a persistent and dangerous sinus. However, when fever, rapid refilling, insufficient drainage from fistulae, subcutaneous leakage or rapid cachexia, with renal insufficiency, exist, rib resection and drainage offer the only chance of prolonging the life of the patient. Hedblom does not advocate drainage unless there is secondary infection, and employs antiseptic solutions in the absence of bronchial fistulas and bleeding. Jehn,² in a paper on this subject, is not in favor of artificial pneumothorax in tuberculous empyemata because it does not prevent reformation of the exudate and may cause spread of the infection. Kalb³ reports 2 cases successfully treated by the method of Murphy. He advocates aspiration of the fluid and injection of 12

¹ Medical Record, 1921, 99, 672.

² München. med. Wchnschr., 1921, 68, 537.

³ Ibid., 1921, 5, 339.

ounces of a 2 per cent solution of formaldehyde in glycerin and the introduction of sufficient air until the manometer reading is near the negative point, or, if it is a case of artificial pneumothorax, the pressure is raised to that usually given the particular patient. This is repeated every few days until the exudate becomes serosanguinous, but the amount of formaldehyde solution should not be more than one-half the volume of fluid withdrawn. The reaction is severe, and, personally, I think the procedure a highly dangerous one.

Abscess of the Lung. The literature on this subject, while brief, is quite interesting. Whittemore¹ reports on his rather extensive experience during the last four years and offers a valuable description of the differentiation between lung abscess and bronchiectasis before operation. This is based on four vitally important examinations: (1) History. (2) Sputum. (3) X-ray. (4) Physical. "Onset in lung abscess is an acute condition following within three or four days, to a week or ten days after a tonsillectomy, for example, starting with sudden pain in the chest, fever and cough, and after a few days a sudden expectoration of a considerable amount of foul-tasting and smelling pus. On the other hand, a bronchiectasis is a gradual chronic condition; cough and fever, to be sure, but a gradual slow increase of expectoration. Bronchiectasis although no age is exempt, is rare in children. The onset is an insidious one, the patient in many cases knowing of no definite beginning. In others, there may have been a slight infection of the respiratory tract, with cough and persistent sputum. The cough is worse during the winter months."

Examination of the sputum reveals in abscess a faint odor that is definite but not as offensive as that found in gangrene or advanced bronchiectasis. The pus separates into layers and, if elastic fibers are found, their presence points very strongly toward abscess. "Streptococci, pneumococci, staphylococci and influenza bacilli are generally found and also appear in cases of bronchiectasis, but in cases of bronchiectasis the influenza bacillus, both intracellular and extracellular, is the predominating organism, whereas in abscess it is never the predominating organism." In regard to the x-rays, he quotes from Holmes and Ruggles and then makes mention of the fact that in a number of his cases in which the lung and pleura were not adherent, the x-ray has localized the process one or even two ribs below where operation proved it to be. He believes this error may be due to the fact that x-ray plates are taken with the lung in the position that it assumes in full inspiration. At operation, the lung is not in this position, and he has found that he was one or two ribs too low. He is rather fearful of advising operation in those cases in which the x-ray, in spite of plates taken before and after the patient has attempted to empty the cavity, fails to show a fluid level, especially if situated near the periphery of the lung. On the other hand, it has been his experience that often the x-ray fails to demonstrate a fluid level in those cases in which the abscess is situated near the hilum. Schwertfeger² gives the following description: "The diag-

¹ Surgical Clinics of North America, 1921, 1, 765.

² Proceedings of the New York Academy of Medicine, February, 1921, discussion, quoted by Lynah.

nosis of abscess of the lung is suspected whenever a patient expectorates sputum which contains evidences of destruction of lung tissue, and especially when the sputum is evacuated periodically.

The physical signs are usually indefinite. There may be slight dulness, diminished breath sounds, and diminished voice, or a moderate number of moist rales with, or without, these physical signs. Occasionally, bronchial breathing, with increased voice sounds, is found. Definite classical signs of a cavity are present only when the cavity is situated superficially, but this is the exception.

"Although the diagnosis of cavity formation can usually be made by the internist, he is absolutely dependent on the roentgenologist and bronchoscopist for the exact location, size and number of these cavities."

BRONCHOSCOPIC STUDIES. In connection with the above must be mentioned the splendid work of Lynah and Stewart¹ and Lynah.² They found that after bronchoscopic suction, evacuation of the involved lobe of the lung, and immediate roentgenography, most of the pus-sponge-soaked lung shadow had disappeared. The interpretation of the roentgenograms made after suction evacuation had materially changed for the better; it was much clearer and the abscess cavity more readily localized than in the roentgenograms taken before bronchoscopic evacuation. The abscess could now be distinctly outlined, and often the branch bronchus with which it communicated. However, further studies were deemed necessary for even more accurate localization of the abscess, especially as to its size and shape, and this Lynah accomplished by the bronchoscopic injection of a bismuth mixture in pure olive oil which would gravitate into and map out the abscess cavity.

Lynah reports that he has so far performed bronchoscopy on 38 patients suffering from pulmonary abscess. Nine followed the sojourn of foreign bodies; 8, tonsillectomies; 10, postdiphtheritic abscesses; 2, lobar pneumonia; 1 an operation for gallstones; 1, necrosis of the jaw. Three were of indefinite cause, probably postinfluenzal. Two followed the aspiration of sea water, and there were pure cultures of colon bacilli in the expectoration. One in a boy was due to lymphosarcoma, and the other in a girl of six years with similar bronchoscopic findings was not diagnosed. He urges that bronchoscopy should not be delayed but performed on the first indication of purulent expectoration. As the technic of bronchoscopy should be in the hands of a man equipped for this special field of work, I will content myself by giving the conclusions of these men. I must first state that Yankaur, in 1916, began to treat pulmonary suppuration through the bronchoscope; an excellent paper by Kully³ refers to the earlier work and he himself has given 1054 bronchoscopic treatments with no untoward results. Four out of 29 cases of chronic pulmonary suppuration are reported as cured. The important part of the papers by Stewart and Lynah is that pertaining to the

¹ *Annals of Surgery*, 1921, **73**, 362; *American Journal of Roentgenology*, 1921, **8**, 49.

² *Medical Record*, 1920, **97**, 215 and *Journal of the American Medical Association*, 1921, **77**, 1548.

³ *American Journal of Surgery*, 1921, **35**, 49.

roentgenographic outlining of the bronchial tree with bismuth mixture. Some of their conclusions are as follows:

1. Bismuth mixtures can be injected into the bronchi and lungs of a living patient without danger.

2. The injection of an opaque substance into the lung of the living patient will open an enormous field of usefulness in the study of cough, the expulsion of substances from the lung, and lung drainage. It will also aid in localizing bronchial strictures in the same manner as in the esophagus. Furthermore, it will be of the greatest aid to the thoracic surgeon by mapping out the abscess cavity in the respective lobe of the lung.

3. Bismuth when it enters the abscess cavity is recognized by its metallic luster, whereas, when it is in the lobular lung structure, it is discerned as a dull, opaque area. Pus diffuses and soaks the lobular structure in a manner similar to bismuth; this often makes the involved area appear many times larger than it really is.

4. The bismuth mixtures injected in these patients was 8 cc of bismuth subcarbonate in pure olive oil (1 to 2). The mixture is rendered sterile by boiling before injection.

5. The injection should be made slowly and not with a "squirt" or else the roentgenographic observations may be spoiled by bismuth soaking the lung structure surrounding the diseased area.

6. While the fluoroscopic examination is important, stereoroentgenographic examination is the best means of localizing the cavitations.

7. Experience has shown that the roentgen examination should be made almost immediately after the removal of the bronchoscope, otherwise the patient, in a fit of coughing, will remove much of the bismuth from the involved lung.

PULMONARY ABSCESS FOLLOWING TONSILLECTOMY. Increasing attention is being devoted to this phase of the etiology of lung abscess. During the past year I have operated on 3 cases in which the symptoms began a few days after the performance of tonsillectomy. Fisher and Cohen¹ collect 76 reported cases, of which 74 had tonsillectomy performed under general anesthesia and hence they conclude that this, whether acting directly or indirectly, is the determining factor in the causation of this complication. The majority of those discussing this paper seemed inclined to lay more stress on the position of the patient than on the anesthesia. The head down position should be maintained not only during the operation but after the return of the patient to the bed until well out of the anesthetic.

OPERATIVE TREATMENT OF LUNG ABSCESS. I referred to this last year and will only refer briefly to the operative technic. Whittemore prefers to do the operation in one stage. He says, "there is one golden time to find the abscess, and that is at the first operation." But I note that he also calls attention to the danger of empyema if the abscess is opened in the absence of adhesions. He uses local anesthesia when the lung is adherent, otherwise general anesthesia with some form of positive

¹ Journal of the American Medical Association, 1921, **77**, 1313.

pressure. After opening a window down to the pleura, this should be inspected and palpated. If the pleura is thickened and grayish in color, one may feel sure that the lung is adherent and that the abscess is not far distant. Occasionally, although on inspection the pleura may appear normal, yet by palpation a firm, hard sense of resistance is felt, and again one may be sure that the region of the abscess is found. If, on the other hand, the pleura is normal and the lung seen moving under it, the chances are that the abscess is not in this region. More ribs should be removed and further inspection and palpation done. As the majority of abscesses are in the periphery of the lung, and in most instances the lung is adherent to the costal pleura in the region nearest to the lesion, this place must be found. After localizing the region of the abscess, this region should be sutured to the costal pleura. It is safe to wait two or three days for adhesions to form before opening the abscess, because if it is opened at this time there may be a leakage of pus through the suture, with an empyema resulting. But in cases in which it seems unwise to wait, the abscess may be opened, using gauze for walling off in addition to the suture. It may be a good technic to pack the cavity with gauze for several days to control any bleeding that may take place, but patients do not like it, as until good drainage is established they still cough up large amounts of pus. Probably the best technic is to place a soft-rubber tube into the cavity and pack gauze around it.

It is necessary to drain the chronic cases indefinitely and the acute cases at least three or four weeks. The position of the drainage-tube must be changed at least every forty-eight hours, and it is better to change it every twenty-four hours. This is done to prevent hemorrhage caused by the end of the tube ulcerating through the wall of any blood-vessel that it may rest on. Whittemore has operated on 31 patients, of whom 5 died following operation, a mortality of 16 per cent. The end-results show that 12 cases are considered well, and another 5 improved, and may eventually become well, yet in these results only 60 to 70 per cent of the cases successfully operated upon are permanently cured or improved.

ARSPHENAMINE TREATMENT OF GANGRENE OF THE LUNG. Molnar¹ reports excellent results in recent cases and believes this treatment should be employed without experimenting with other remedies. Several other "cures" are reported in a Finnish Journal² in connection with the numerous reports upon the value of arspenamine in certain cases of gangrene of the lung; it is worth while calling attention to the paper by Kline³ who finds in 3 cases of early gangrene of the lung the presence in large numbers of fusiform bacilli and spirochetes. The latter morphologically resemble *Spirochete buccalis vincenti*, etc. He suggests the etiological relationship of these to primary gangrene.

Injuries to the Thoracic Duct. It is only rarely that I am able to refer to this subject, probably because most of the cases are not reported or unrecognized owing to the fact that even if the duct is injured in opera-

¹ Wien. klin. Wchnschr., 1921, **34**, 255.

² Journal of the American Medical Association, abstract, 1921, **77**, 1380.

³ Ibid., 1921, **77**, 1874.

tions on the neck, it is subsequently clamped and ligated. A short account of 2 cases is presented by Ebington.¹ The first case occurred during an operation for tuberculous glands of the neck in a boy, seven years old. The thoracic duct was not seen, and there was nothing unusual in the wound at the conclusion of the operation. At the end of thirty-six hours it was noticed that the dressings were soaked with a watery discharge and that fever was present. On the fourth day the wound was opened up, and sponged out; the welling of fluid had ceased but the jugular vein was found to be very fragile. There was no pus in the wound and the muscles were peculiarly clean and bare. Death took place on the night of the sixth day from hemorrhage. In the second case, an extensive dissection had been performed but the thoracic duct was not identified. On the following day there was copious discharge, fever and maceration of the tissues. The wound was opened, and packed. In the discussion on this paper, Young² reported a case following dissection of the neck, with discharge of watery glairy fluid and which recovered after packing.

TRAUMATIC CHYLOTHORAX. Somewhat akin to the above is the paper by Watts³ who reports a case of chylothorax caused by a stab. Watts works up the literature on the anatomy of the lymphatics of the chest and on the collected cases of non-operative injury of the thoracic duct. He states that the clinical manifestations of chylothorax are those of a simple pleural effusion, the diagnosis being made by aspiration and careful microscopical and chemical examination of the fluid. There are seldom any subjective symptoms except dyspnea and weakness. As regards treatment, aspiration should be done for the relief of pressure. He does not recommend thoracotomy and quotes Hall and Morgan⁴ who claim that all that the injured duct needs for recovery is rest, which is secured by exclusive rectal feeding, but Watts does not think that experience will bear out this idea. Personally, I fail to see why one should not perform an exploratory thoracotomy. According to the reported cases collected by Zesas in 1912, the mortality was slightly over 50 per cent.

THE ESOPHAGUS.

Carcinoma of the Esophagus. The limitations of space would prevent more than a superficial review of the literature of the year on this subject. An excellent review by Bidgood⁵ summarizes the principle procedures and tabulates 25 cases reported since 1871 in which a radical operation has been performed. Fourteen of these were in the cervical region and 11 in the thorax. Bidgood apparently advocates the performance of the skin tube method of Madlener.⁶ The steps of this operation are: First operation: (1) Formation of skin tube (see Fig. 28); (2) esophageal fistula in the neck with its union to the upper end of the skin tube; (3)

¹ Glasgow Medical Journal, 1921, **13**, 398.

² Lancet, 1921, **1**, 806.

³ Annals of Surgery, 1921, **74**, 691.

⁴ Quarterly Bulletin, Northwestern University Medical School, vol **11**, 1, p. 44.

⁵ Annals of Surgery, 1921, **74**, 546.

⁶ Deutsch. Ztschr. f. Chir., 1920, **155**, 410.

gastrostomy. Second operation: (1) Y-anastomosis of jejunum; (2) union of lower end of skin tube and isolated jejunal loop; (3) anastomosis of jejunal loop and stomach.

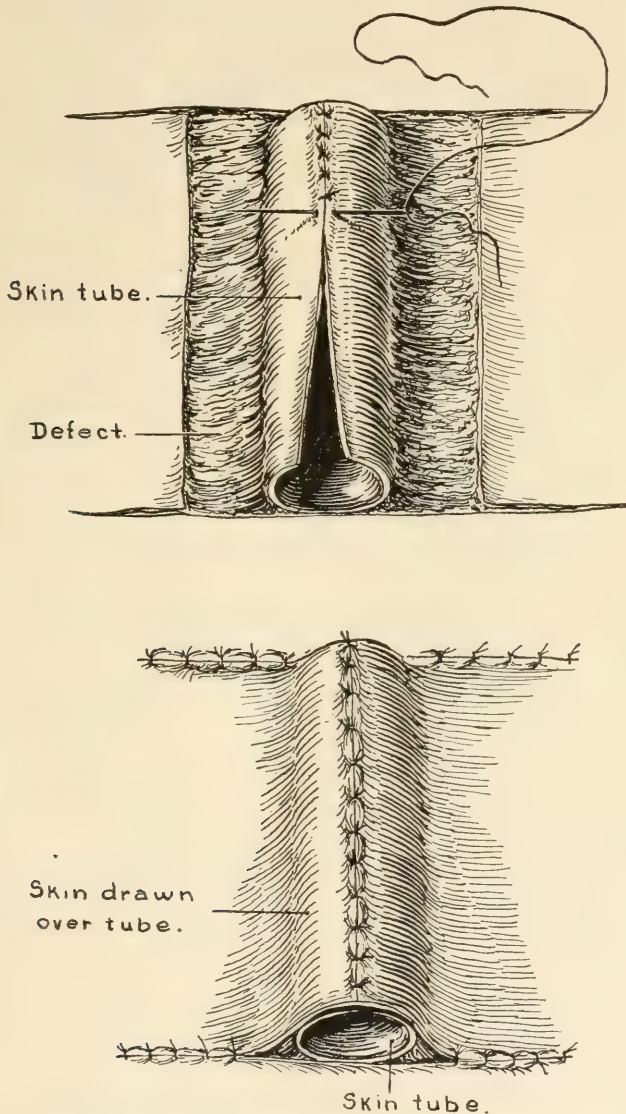


FIG. 28.—Constructing a skin tube to connect esophagus and jejunal segments. (Bidgood.)

Another fairly complete paper is that of Lundblad.¹ He also goes over the various operations which have been performed and favors an antethoracic operation. He does not approve of the use of skin to form

¹ Acta Chir. Scand., 1921, 53, 535.

an esophageal tract even if the distance to be bridged is small. The digestive juices almost always interfere with, or prevent, healing, and when skin is used a continual irritation is present. He also states that hair growing from the epidermis is another objection, but this is not well founded because it is quite easy to depilate by preliminary use of the x -ray. He also thinks that cancer might develop as the result of irritation of the skin from the digestive juices. Hence, he argues, that the tract should as nearly as possible reproduce normal conditions by being formed from intestine from the stomach to the esophagus in the neck. Because of the insufficient length of a segment of jejunum, Lundblad prefers the transverse colon. Another article along similar lines has been published by Kreuter.¹

Most of the attempts at removal of the thoracic esophagus have been made by a technic which crosses the pleura, opens the pleural cavity, and exposes the patient to septic meningitis. Consequently, the extraordinary report by Lilienthal² marks an epoch in the surgery of cancer of the thoracic esophagus. The paper should be carefully read in its entirety and in connection with it the discussion before the New York Surgical Society³ should also be read. As a result of his experience in this case, together with 6 other cases of transpleural exposure of the esophagus with one recovery, Lilienthal has reached the following conclusions:

1. That transpleural resection of the esophagus had a forbidding mortality.

2. That fatal infection follows the primary opening of the esophagus within the mediastinum.

3. That it is feasible to make an extrapleural exposure of the posterior mediastinum large enough to permit the operator to see clearly and to work safely with both hands.

4. That resection of the esophagus in the posterior mediastinum can be done by dividing the operation into two stages. At the first, the esophagus is freed from its attachments and the mediastinum is sealed. At the second, ten to fourteen days later, the resection is performed.

5. This procedure deserves a fair trial by thoracic surgeons.

In the discussion before the New York Surgical Society, Meyer said he felt that the transthoracic route should not be abandoned, as it gave free access to every portion of the esophagus. Subsequent, air-tight, thoracic drainage gave the assurance that an accumulation of infected pleural fluid would not follow and endanger the patient's life. He further believes that it might be advisable in special cases to combine antethoracic transposition of the proximal stump of the esophagus through a wound at the neck with resection of the growth by posterior mediastinotomy. Neuhof, in the same discussion, reported an operation carried out along lines as described by Lilienthal, but in which an unsuccessful outcome was anticipated. Neuhof suggested the use of a rubber tube, as in the operation for reconstruction of the common bile

¹ Zentralbl. f. Chir., 1920, **47**, 1266.

² Annals of Surgery, 1921, **74**, 259.

³ Ibid., **73**, 116.

duct, which would enable a tube of granulation tissue to form which might become lined by cells continuous with the esophageal epithelium and thus replace the defect. I believe that Lilienthal's operation will be the starting point for new methods which, by reason of the probable lowering in mortality, will command more respect from the profession at large. Personally, I believe that more attention should be paid to the cure of the thoracic esophageal cancer before we attempt elaborate plastic operations for the restoration of the esophageal tube. As Green, in the above discussion, remarked, the present results of treatment by radium or *x*-ray are no more uncertain than surgical interference. He believes the method of Lilienthal will enable surgical advances to be made more rapidly.

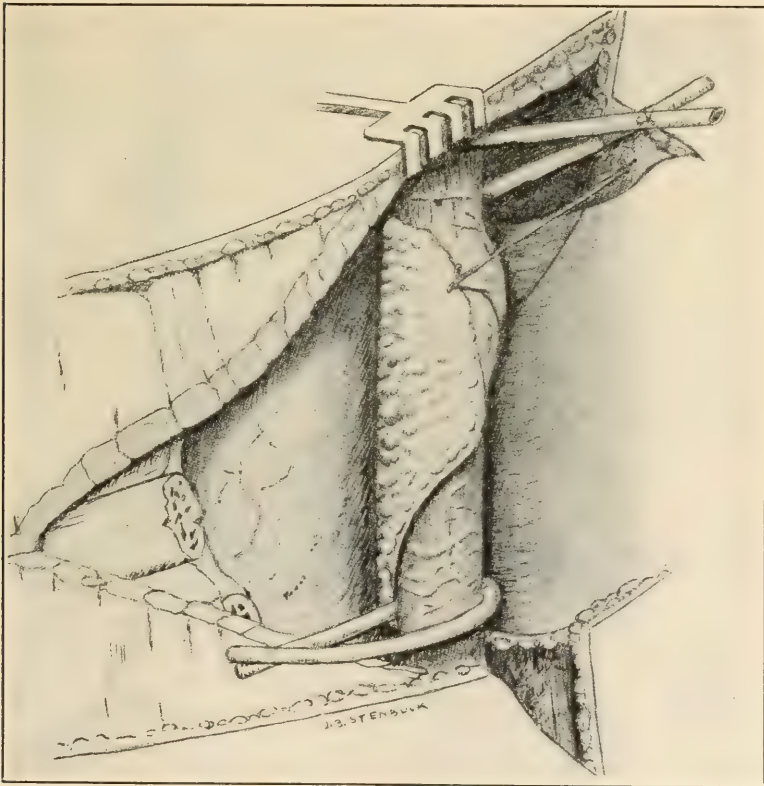


FIG. 29.—Skin flap partly surrounding esophagus and held in place by a suture to the chest wall. The two rubber tubes are left in place to act as retractors at the next step of the operation. (Lilienthal.)

An excellent brief description of this operation is given by Lilienthal¹ in another article. The patient was a man, aged thirty-five years, with a partially obstructing squamous-cell carcinoma below the arch of the aorta. At the first step, the operator lifted a skin flap about three inches

¹ Boston Medical and Surgical Journal, 1921, **185**, 358.

in width and ten inches in length which was outlined by an incision beginning at the eighth interspace close to the spine, passing obliquely forward parallel to the ribs, thence downward and then backward to a point about three inches below the place of beginning. This flap was used in fashioning the new esophagus to take the place of the resected part (Fig. 29). A six-inch subperiosteal resection of the ninth rib was then made and the pleura stripped forward away from the posterior mediastinal region. The eighth, seventh and sixth ribs were cut through near their spinal attachments after peeling the pleura away and then the tenth rib was also divided. The pleura could now be pushed forward, exposing the organs within the mediastinum through a wound large enough to permit the surgeon to work with both hands in its depths. With a stomach-tube in the esophagus, this structure was easily identi-

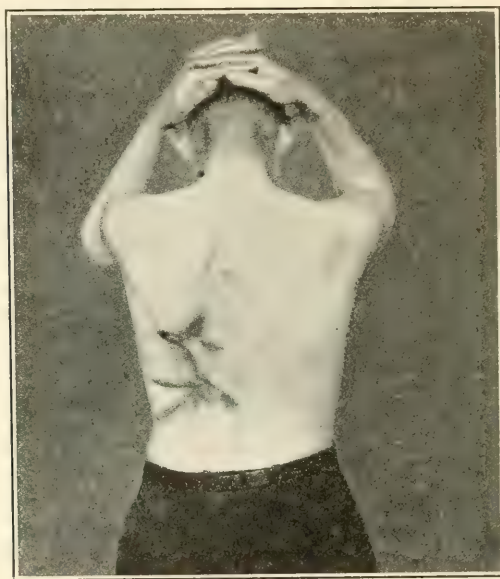


FIG. 30.—Wound healed after plastic operation. (Lilienthal.)

fied and stripped from the pleura and aorta. The fibers of the plexus gulæ of the right vagus were divided. The fusiform swelling which marked the tumor within the gullet was about an inch and a half below the arch of the aorta. The skin flap was placed into the wound so that it partly encircled the mobilized esophagus, the cutaneous surface toward the viscus. This first step of the operation was concluded by packing the wound with gauze. The patient could swallow fluids. Two weeks later, without anesthesia of any kind, the wound was spread apart and the tumor-bearing section of the esophagus was resected. Nourishment was now given through a stomach tube passed into the lower esophageal opening and later through an Einhorn tube passed from mouth to stomach through the gap left by the resection. The pedicle of the skin flap was cut across in another week. There was later contraction of the

cicatricial tissue at the mucocutaneous margins, making it necessary to divide the strictures by stellate incisions and thereafter bougies were passed frequently (Fig. 3). The final step was to close the posterior esophageal opening by suture and to make a plastic operation to cover the defect in the patient's back with skin by the use of sliding flaps. A few days after this final procedure, liquids could be swallowed without leakage, and soon all wounds were healed and any soft food could be taken normally.

RADIUM TREATMENT OF ESOPHAGEAL CANCER. Until surgical procedures are rendered more safe and the technic simplified most physicians will advise patients with this disease to seek relief from radium. A simple method for the introduction of radium has been devised by Rocky.¹

A ten yard spool of the largest size of buttonhole silk twist is threaded on a small tape, and tied loosely around the patient's neck. A couple of feet may be reeled off the spool, and taken into the patient's mouth, and started with a swallow of water. The thread should be fed from the spool slowly, only a few inches at a time, to avoid a tangle above the stricture. By the next day 15 or 20 feet may have been swallowed, and the thread may even project from the anus. It may now be drawn upward until quite taut, being held by the convolutions of the intestine. The loop of the piano wire guide is now threaded on it, and while the thread is drawn taut, and then only may the wire guide be safely passed through the stricture on the silk thread. If the lumen is not sufficiently large, it may be increased by pushing down perforated shot and metal balls in increasing size, and then in a diminishing size, to dilate the lumen and also permit safe withdrawal. The radium applicators are pushed into a soft rubber catheter, and this is fastened to the loop of the second piano wire by a silk stitch. This may now be pushed directly into the center of the carcinoma, and the proper dose and time treatment given.

The position of the applicator is of the greatest importance. To be efficient, the radium must be exactly in the center of the mass. At first the sense of resistance, as the end of the catheter enters it, may be sufficient. Careful measurement on the first wire must then be made of the previously ascertained distance from the teeth which the second wire must be pushed to place properly the radium applicator. It may be well to confirm this by a roentgenogram and by comparing it with the barium picture of the stricture. When this point is definitely ascertained, a record of the distance from the teeth to the upper end of the wire should be made, for use in future treatment of the case.

¹ Journal of the American Medical Association, 1921, **77**, 30.

INFECTIOUS DISEASES, INCLUDING ACUTE RHEUMATISM, CROUPOUS PNEUMONIA AND INFLUENZA.

BY JOHN RUHRÄH, M.D.

THE contributions to the literature on the infectious diseases during the past year have been in the main few and far between. Not only has the number of contributions been less than in former years, but the quality has suffered. This I take to be the effect of the war which caused a great spurt of energy in every direction and we are now in the period of reaction, where but few observers seem to have energy for anything but the most trivial investigations. There are some workers, however, who continue to put forth a good product.

By far the most important disease is *epidemic encephalitis* to which I have devoted a considerable section of this review as it seemed to me to be worthy of it. Innumerable studies on all phases of the subject have been made in all the different countries where medical journals are published. The disease has been described under a great variety of names, many taking one phase of it and reporting several cases under some unusual title, but, for the most part, it has not been difficult to place them where they belong.

A second feature of the literature is the growing prominence of the *Schick test* and the *toxin-antitoxin immunization in diphtheria*. In New York in particular, the test and immunization has been applied to a very large number of school children and the next few years will tell whether this test and the immunization method are of as much practical value as they would seem. The diphtheria morbidity and mortality is a disgrace, as we apparently know more about the prevention and cure of this disease than almost any other infection and yet no very great inroads have been made on either morbidity or mortality beyond what occurred after the introduction of antitoxin. I have been over a number of papers dealing with various phases of diphtheria which I feel could be read with a considerable amount of interest.

Another disease which has come very much to the fore in the past year or two is *glandular fever*, originally described by Pfeiffer in 1889. The passion for making new names has led to the disease being reported as something entirely new under various titles, which is unfortunate, as glandular fever certainly covers the symptom-complex better than any of the suggested substitutes.

Influenza is no longer occupying the attention of physicians and medical editors the way it did a year or two ago but there are still a comparatively large number of contributions dealing with various phases of the subject, a good many of which are belated studies made

at the training camps during the late war. Nothing of any particular interest has been added to our knowledge of the disease and we are as much in the dark concerning its etiology and the causes of epidemics as we were before.

Among other belated papers is one of exceptional interest on *epidemic jaundice*. This disease is becoming much better known and the pathologists and epidemiologists have given us a fair understanding of it, but there are many points in connection with it, particularly its treatment, which remain for future investigators.

The subject of *malaria* never seems to have as much attention paid to it as it ought considering the terrific onslaught that it makes on our population, particularly in certain parts of the country, but there have been, as is always the case, a few articles dealing with not only the scientific but the practical side of the question.

Another hopeful sign is the interest taken in *measles*. This disease which is with us always, which almost everyone has at some time, and which is the cause of disablement or death in many, has never received the attention which it merits. One would think that pathologists and investigators would attack such a disease and study it intensively until they arrived at some definite conclusions concerning it. In the past year there have been a number of studies made, and I have no doubt this will lead to further studies in the near future.

Poliomyelitis, while not occupying the position it did a few years ago, is still with us and during the past year was somewhat on the increase. Perhaps the chief interest of this disease this past year is the publication by Rosenow of the results which he has obtained in the use of his anti-toxic serum, which I have given in some detail.

Scarlet fever, another disease which ought to claim more attention than it does, has also come in for some slight notice. If investigators with original minds, of which there are but few, could be led to study such diseases with a view to ridding them of their terrors, if not causing their disappearance entirely, it would be infinitely better than to work with many of the problems that have so little practical value.

The Bacterial Content of Telephones. A good many years ago Bissell brought up the question as to whether the public telephone had anything to do with the transmission of disease and some studies were made with reference to diphtheria. Subsequently other studies were made by different observers with reference to pathogenic bacteria, and Allan was able to isolate the tubercle bacillus from the instruments in public places.

More recently, Saelhof¹ has made a study of this subject and comes to the conclusion that various pathogenic bacteria are present and can be isolated from the transmitters and receivers of telephones. In a study of 94 telephones, hemolytic streptococci were isolated in 15.9 per cent, the diphtheria bacillus in 2 per cent, and the pneumococcus in 1 per cent. The hemolytic streptococci were found to be virulent for rabbits in 90.0 per cent.

¹ The American Journal of Hygiene, March, 1921, p. 234.

Saelhof suggests that public telephones be sterilized by cleansing with soap and warm water and subsequently using bichloride of mercury, lysol, or some other disinfectant for a period of ten minutes. He also suggests that the public should be taught how to use the telephone hygienically, and that the mouth should not come in contact with the transmitter.

If the public does not take any more interest in this phase of public hygiene that it does in other much more obvious things, which cause the spread of disease, the outlook in this direction is not particularly bright.

Blastomycosis. Howes and Morse¹ have reported 2 cases which show the importance of careful study of cases which might otherwise be taken for tuberculosis. They state that since Busse reported his case in 1894 there have been 50 cases reported.

The first case was a white man, thirty-two years of age, who was born in Belgium, but who had been living in Detroit for five years. In 1919, he felt badly for a month and developed a slight cough, occasional chills, and night sweats. By December, he remained in bed for five weeks, and the diagnosis was made of influenza. He finally got up and went to work, but after four weeks had to give it up. He continued to lose weight and strength, and, finally, in June, 1920, was sent to a tuberculosis sanatorium. He was extremely weak, complained of pains in the knees, ankles, and left chest, and had occasional night sweats. There were changes in the left lung and the roentgen-ray examination showed shadows and evidence of peribronchial infiltration. The shadows suggested an unresolved pneumonia or interlobar pleurisy with effusion. There was no sputum. On examination, the patient was found to have swellings over both eyes; abscesses on both legs and feet, the pus from which contained blastomyces. The patient died fourteen weeks after admission to the sanatorium, and the autopsy showed extensive involvement of the lung due to the blastomyces.

The other patient was an Italian of the same age who was sent in as a case of tuberculosis. He had changes in the lung and sores on the body, part of which were found to contain the blastomyces.

Antimony Tartrate in Bilharziasis. There have been quite a number of contributions bearing on this subject, we need only call attention to the short report of Lasbrey and Coleman.² They have studied 1000 cases treated by intravenous injections of antimony tartrate. The method used was that as originally suggested by Christopherson. From seven to twelve injections are given, the total amount of the drug administered varied between 12 and 27 grains. They believe that the gradual administration of the drug is better than rather massive doses. A careful observation of the patient is necessary, and the dose should be lessened or omitted at the slightest indication of any untoward symptoms. In their series of 1000 cases there were 10 deaths. In the second 500 cases, 348 were pronounced cured, that is, nearly 70 per cent. In

¹ Boston Medical and Surgical Journal, September 15, 1921, p. 315.

² British Medical Journal, February 26, 1921, p. 299.

the first series the results are not satisfactorily given owing to a lack of records.

Pulmonary Botryomycosis. Among veterinarians the pedunculated fibrous granuloma of horses is known as botryomycosis. The condition was first described by Bollinger, in 1870, in the lung of a horse, but it more frequently occurs on skin surfaces, particularly where there have been cuts. In 1897, Poncet and Dor described a case on the palmar surface of the hand of a woman. Cases of human beings have been reported in France, Italy, and Switzerland, and it is said to be particularly common in Northern Africa.

The first case to be reported from the United States is one studied by Opie, in 1913, and this is also the first instance in a human being in which there is involvement of an internal organ. In this case a very large part of the liver had undergone necrosis, with extensive scarring and the formation of abscesses containing the characteristic granules. The lesions consist of granulation tissue in which are embedded granulations consisting of coccus-like organisms surrounded by hyaline material. These are Gram-positive and as characteristic for this disease as the sulphur granules are for actinomycosis. Some believe these organisms are staphylococcus aureus, while others believe them to be a specific coccus.

McJunkin¹ has reported an instance from St. Louis in a male infant four months of age. The baby had had a bad cough for six weeks, three weeks previous to the examination had high fever for a week. When seen, the temperature was normal and the respiration 50. There was an impaired percussion-note over the entire right side, and the breath sounds were suppressed, accompanied by fine crackling rales with suppressed breathing posteriorly over the left chest. The impression was that it was bronchopneumonia which had not cleared up. The child died and the autopsy revealed nothing abnormal except in the lungs. In these organs the lesions were typically granulomata, with the characteristic granules. The disease is said to be not uncommon in horses in the middle west.

Infectious Eczematoid Dermatitis. The dermatologists take more joy in finding a new name for some well known condition than they do over the ninety-nine thousands of names they already possess. Not that the title of this paragraph is exactly a new name but it seems to me to belong to that large class of terms used to designate skin diseases, which could often very well be done away with. Not so the dermatologists, for Sutton² says, "It has been recently stated that the term 'infectious eczematoid dermatitis' is lacking in grace and euphony as well as in accuracy, but at this time I know of no appellation that will adequately take its place."

The condition in question is a very common one, certainly in early life, and why it could not be described simply as a skin infection is one of the mysteries of medicine. The disease is usually secondary to some suppuration, furunculosis, or scabies, and the first appearance may be a

¹ Archives of Internal Medicine, April 15, 1921, p. 457.

² Journal of the American Medical Association, October 9, 1920, p. 976.

vesicle, pustule, or a small crusted point, or sometimes merely a scaly or reddened area. Sutton states that the vesicles are not so closely placed and are larger than those seen in an acute symmetrical vesicular eczema. There is no symmetry in the arrangement of the lesions, except such as may occur accidentally. It occurs in patches, usually of not very great extent, and these are circumscribed, with sharply defined borders. There is a certain amount of exudation which dries, forming a crust. The disease spreads by peripheral extension and the formation of new areas by autoinoculation. Naturally, it occurs most often on the exposed parts. There is not very much itching and the adjacent lymph nodes are usually enlarged.

The treatment is exceedingly simple, merely cleaning up the areas and using mild non-irritating antiseptics. If the lesions are just starting, an aqueous solution of aluminum acetate (0.5 per cent) is effective. If suppuration is well established, a 1 or 2 per cent ammoniated mercury ointment over the infected areas is of value. If there is much itching, 1 per cent of phenol or 0.5 per cent of menthol may be added to the ointment, or the well-known calamine lotion may be applied. Skillern has advised the internal use of alkaline preparations, such as sodium acetate and sodium citrate. The staphylococcus vaccine may be used to advantage in very resistant cases. There are instances on record in which very persistent cases were relieved by exposure to the x-ray. Another suggestion is to use 1 per cent potassium permanganate solution on the lesions, giving them a thorough application every day for four or five days. Roussel suggests cleaning off the areas with gasoline and applying a saturated solution of salicylic acid and follow this with a weak ammoniated mercury ointment.

Diphtheria. THE SCHICK TEST AND TOXIN-ANTITOXIN IMMUNIZATION IN THE PUBLIC SCHOOLS. New York seems to be one of the few places where the Schick test is given its proper value. With the consent of the parents, the children in the public schools are examined and, if they show a positive reaction, they are given injections of toxin-antitoxin. As a rule, three injections are given at weekly intervals but as experience has shown that two injections will protect over 70 per cent of the susceptible children, two injections are given and then another Schick test made at the end of two or three months, and only those children who still show a positive reaction receive the third injection. Certificates of immunity against diphtheria are issued to those found to be naturally immune and to those successfully immunized. The Health Department¹ urges physicians in private practice to make the Schick test and give the toxin-antitoxin injections to children of school and pre-school age who are under their professional care. Outfits for making the test and the injections are supplied by the Department at certain of their supply stations. The Department of Health lays a considerable stress in their circulars upon the fact that the toxin-antitoxin should not be used when there is exposure to diphtheria and immediate danger to the disease. Under such circumstances they recommend only antitoxin to be given

¹ Weekly Bulletin of the Department of Health, City of New York, April 2, 1921, p. 105.

to susceptible individuals, the reason for this being that the injection of antitoxin confers an immediate passive immunity against diphtheria, while the injections of toxin-antitoxin bring about an active and rather permanent immunity, but only after four to eight weeks. Where the prophylactic dose of antitoxin has been given the toxin-antitoxin injections may be given in one months' time. It is necessary to allow four weeks or so to pass during which time much of the antitoxin has been eliminated from the body, otherwise it will over neutralize the toxin-antitoxin and so interfere with the production of a satisfactory immunity.

Zingher¹ has given in detail *methods of applying the Schick test* to children in the public schools. The school is prepared for the test by interviewing the principal and inviting the coöperation of the school authorities. Consent blanks and circulars of information to parents are then left at the school to be distributed to all the children. The conference of teachers is addressed by the principal or a physician, and their coöperation requested. Each child is required to return the consent blank signed by the parent, with an affirmative or negative statement. Lists are then made of the children to be tested. Through good coöperation it was found possible to apply the Schick test and the control test to as many as 500 children each hour. In one school 2400 children were tested in one day, and in another public school over 2700 children. The needles were thoroughly cleaned and sterilized between the tests by wiping them off with a cotton sponge which was placed in a Petri dish and saturated with 95 per cent alcohol. A 1 cc "Original Record" syringe and a 26 gage one-fourth inch steel needle was found most useful. The toxin is diluted so that each 0.2 cc represents $\frac{1}{40}$ of the minimal lethal dose. For the control test 1.5 cc of toxin heated to 75° C. for ten minutes, diluted with 1000 cc of salt solution was used. The test is made on the right forearm about two or three inches below the bend of the elbow and the control test on the left forearm to correspond with the location. The reading of the reactions is of very great importance. Zingher gives the following instructions:

"From three to seven days after the Schick tests, the reactions were read. By reading the tests before three days have elapsed, the interpretation of the reactions is not as accurate. Readings made on the third and fourth day showed somewhat better the fading pseudo-reactions, but a few doubtful reactions still remained, especially of the positive combined type. These were more accurately interpreted at the later readings. Very faintly positive Schick reactions, however, were likely to show no redness and only a slight brownish pigmentation on the seventh day.

Negative pseudo-reactions appear at their greatest intensity at the end of twenty-four hours. By the fourth day, many of these reactions show only a moderate, or a faint brownish, pigmentation. With some, the shade of redness persists. Others often show a bluish-brown discoloration at the site of the test end of the control. Invariably, however,

¹ Journal of the American Medical Association, September 10, 1921, p. 835.

the reactions are quite equal in appearance on the two forearms. Slight differences between the test and control reaction may have no significance. Variations in the bacillus protein content of the test and control solutions, or variation in the technic where different individuals make the Schick test and the control test, may account for these slight differences on the two sides. Marked differences, in which the area of redness at the site of the Schick test is always more pronounced and has the other characteristic appearance of a positive reaction, should lead one to interpret the Schick reaction as positive combined. Children who have these positive combined reactions almost always show the more severe local and constitutional reactions after the injection of toxin-antitoxin.

Occasionally we see a small, sharply circumscribed, bluish discoloration on one or both forearms. This is produced by slight hemorrhage into the skin at the time of the test, and such reactions are seen quite frequently in children with a hemorrhagic tendency.

The Schick reactions are read as (a) positive, (b) positive combined, (c) negative and (d) negative pseudo. The first and second reactions indicate susceptibility to diphtheria, and the children showing these reactions are given the toxin-antitoxin injections. The third and fourth reactions indicate immunity to diphtheria.

The term "positive combined" reaction is used to indicate more clearly the reaction previously known as "combined," and the term "negative pseudo-reaction" to indicate the reaction generally known as "pseudo-reaction." These new terms will help in representing more accurately to the reader the susceptibility or immunity, respectively, of the individual who has been Schick tested.

The local and constitutional reactions after the injections of toxin-antitoxin varied considerably in different children. As a rule, those children who had given a simple positive Schick reaction showed very little local disturbance. On the other hand, children who had had a positive combined reaction presented considerable local redness, swelling and tenderness of the arm at the site of injection and varying degrees of constitutional disturbance. Some of these children had a temperature varying from 100° to 103.5° F., which persisted for from one to three days. In all children, however, the local and constitutional symptoms subsided without any after-effects. One of the interesting features was the practical absence of even a moderate local reaction among the young children of the kindergarten and Grade 1 A classes.

The test was made in forty-four schools in Manhattan and the Bronx, and some interesting observations were made. It was noted that children from the homes of the more well-to-do have a much higher percentage of positive Schick reaction than those from the homes of the poorer classes who live in closely crowded neighborhoods. The highest number of positive reactions found was 67 per cent, and the percentage decreased until it was found that in the schools in densely congested sections the number of positive reactions was as low as 16 to 20 per cent and in one instance 13.6 per cent. Repeated exposure to the diphtheria bacillus in the congested districts probably produces mild infections

in the membranes which are not recognized as diphtheria but which may lead to the development of an antitoxic immunity.

Compared with these figures are those of two private schools. In one, 79 per cent of the boys gave positive reactions, and in a second 85 per cent, showing that segregation of the children either in rural or well-to-do and sparsely settled sections, plays an important part in the non-development of natural immunity to diphtheria.

Studies made with reference to race also gave some interesting results. Negroes living in congested neighborhoods showed, in spite of the crowded conditions, a high proportion of positive Schick reactions, while children of Italian extraction living in the crowded east Harlem section of New York City, gave the lowest percentage of positive reactions. Jewish children varied with the section in which they lived, those in the congested parts of the city showing low percentage, while those living in the upper west side gave the highest percentage of positive reactions.

The family factor is also of importance in the development of natural immunity. It was found that there was a marked tendency for all the children of the same family to show a similar Schick reaction, whether it was positive or negative, and if there were no variations it was usually found that the younger children gave the positive and the older the negative. Zingher is of the opinion that it is probably a hereditary tendency on the part of the children in one family to respond either readily or slowly and poorly with antitoxin production to repeated mild infections with the diphtheria bacillus. In all larger communities the diphtheria bacillus is universally prevalent and Zingher states that in New York City the number of carriers averages 4 or 5 per cent.

Negative pseudo-reactions were found in some schools in 20 to 25 per cent of the children. These figures Zingher takes to indicate that it is strongly advisable always to use the control test along with the Schick test in children over five years of age and thus avoid giving them the injections of toxin-antitoxin. The results of the Schick retests which were made in the schools after two to five months indicate that it is better to wait from three to five months before testing for an active immunity after testing for toxin-antitoxin injections. It was found that two injections of toxin-antitoxin, even of larger amounts, do not give as good results as three injections of a smaller amount. Children under six months should not be injected with the toxin-antitoxin mixture. From 85 to 90 per cent of them are immune and do not respond to the injections. Zingher believes that all children from six months to five years should be injected with the toxin-antitoxin, and he believes that the omission of the Schick test is not of as much importance in this age group, as most of the children give a positive reaction. He believes that to place the diphtheria preventive work on a practical basis, it is advisable at present to simplify it for the school physician by omitting the Schick test in younger children and by immunizing all children in the incoming classes. No child should be reported as being immune to diphtheria until it gives a negative reaction. Zingher gives the following table:

IMPORTANCE OF AGE IN ACTIVE IMMUNIZATION WITH TOXIN-ANTITOXIN.

A. Infants Under Six Months:

- (a) Under three months. Children mostly immune (maternal). Do not develop an active immunity after toxin-antitoxin.
- (b) Three to six months. Generally found to be immune (maternal). Toxin-antitoxin may be used, but it is not as effective as when used in the following age-group. A negative Schick test cannot be depended on to indicate a permanent immunity.

B. Preschool Age:

- (a) Six months to two years. Schick test can be omitted in this group, as the proportion of positive reactors is very high. A negative Schick reaction cannot be depended on to indicate a permanent immunity. Strongly advisable to give toxin-antitoxin to all these children.
- (b) Two to five years. Schick test may be used first. Positive reactions very high. Procedure can be greatly simplified by omitting Schick test and injecting all these children with toxin-antitoxin.

C. Public School Age:

- (a) Five to six years. Incoming classes (kindergarten and 1 A). Schick test may be used first. Positive reactions over 65 per cent. Strongly advisable to inject all these children with toxin-antitoxin.
- (b) Six to fifteen years. Schick test and control should be used first. Many negative pseudo-reactions must be excluded. Toxin-antitoxin for Schick positive and positive combined reactors.

D. High School Age:

- (a) Fifteen to nineteen years. Schick test and control test should be used first. Many negative pseudo-reactions must be excluded. Toxin-antitoxin for Schick positive and positive combined reactors.

E. Adolescents and Adults:

- (a) Nineteen years up. Schick test and control test should be used first. Many negative pseudo-reactions must be excluded. Toxin-antitoxin for Schick positive and positive combined reactors.

MILK-BORNE DIPHTHERIA. Outbreaks of diphtheria due to milk are very well known and ordinarily would need no comment, but the epidemic described by Henry¹ is so remarkable that it is worthy of a note.

On August 20, 1920, 4 cases of diphtheria were reported from Williamstown, Mass., which has a population of 4200 and is the seat of Williams College. On the next day, 9 more cases were discovered, and on the 22d and 23d 9 others were reported and 11 more before the last of the month. All of these had onsets not later than August 24. There had been a case of diphtheria in July at a college boarding house occurring in a young woman who was on her vacation. She did not see a physician until five days after the onset of the disease at which time a diagnosis was made and she was quarantined, leaving the state on August 10. Of the first 13 cases of the outbreak, 5 occurred in the house which this young woman had occupied. Of the other cases, 2 had been in contact with one of these cases. Five of the remaining 6 lived in different parts of the town but had the same milk supply as the boarding house. The remaining patient reported another supply. During the day in which the investigation was taking place 4 new cases were reported unrelated to the boarding house group and 3 of these used the same milk, while a fourth on the second questioning stated that he had bought a quart of cream from the dairy in question. Checking over the whole list of patients up to this time, it was found that 20 out of 21 had the same milk and it was found later that the additional patient had purchased

¹ Journal of the American Medical Association, December 8, 1920, p. 1715.

extra milk from a grocer who handled the product of the dairy in question.

Cultures were made from the family of the dairyman and the other milk handlers, 15 in all. A daughter of the owner had a sore right index finger. The nail was gone and there was a soft brownish scab covering a soft white exudate. The sore was apparently healing and had probably been worse. She had milked except when her finger was too sore to do so. Cultures from this lesion showed diphtheria bacilli. It is very curious that this case of wound infection did not cause any carriers or cases of the disease among 15 persons at the milk farm, 9 of whom were from one to twenty years of age.

On September 15, a second outbreak began in which there were 14 cases. It was then discovered that one of the cows had a teat infected with diphtheria bacillus and that one of the milkers had the organism in a sore on his hand. The sore place was the result of having been struck with a hammer on September 13.

The promptness with which this epidemic was suppressed is very good evidence as to the value of a wide-awake health department with individuals capable of determining the source of infection.

THE INOCULATION OF HUMAN THROATS WITH AVIRULENT DIPHTHERIA BACILLI. The subject of avirulent diphtheria bacilli is one of very great importance but one which, for some reason, has never attracted the attention that it deserves. True enough, a considerable amount of work has been done on this subject but the results have not been put into anything like the use which they should be. I refer particularly to health departments. The methods in vogue in many cities of making cultures of entire schools and excluding all children whose throats happen to have in them organisms resembling culturally and morphologically diphtheria bacilli is, in my opinion, a very crude way of safe-guarding the public health. In a very large number of cases these organisms are avirulent, and have no significance from the standpoint of producing disease. This method works great hardship, not only on the child but on the parents as well, inasmuch as in some places strict isolation is required until cultures have been made of the family.

In view of all this, the observations made by Moss, Guthrie and Marshall,¹ are of great interest. These observers have previously reported the examination of a large series of children and adults and found that healthy diphtheria carriers number about 3.55 per cent. They also found that a second examination of a large series of persons practically doubled the number of carriers discovered, while a third examination still further increased the original number. It has been found that the percentage of carriers varies in different localities in the same year, and in the same locality in different years. At all events the number of so-called carriers is far in excess of the number of clinical instances of the disease. A study of the carriers with reference to the development of the disease in two rather large series were negative. Over 200 carriers were studied with reference to the virulence of the organisms, and these varied between

¹ Johns Hopkins Hospital Bulletin, February, 1921, p. 37.

11 and 18 per cent, and, curiously enough, none of these carriers seemed to have caused any outbreaks of the disease, although, of course, there is no doubt as to the part sometimes played in the spread of the disease by healthy carriers. Personally, I am inclined to believe that the danger of such carriers has been greatly over-estimated, and that it will be found that a carrier is dangerous only when he has been in contact with a case of the disease within a recent period. There may, of course, be some exceptions to this.

Two questions have arisen. One concerns the reliability of the guinea-pig test for toxin production by the diphtheria bacillus, with the suggestion that an organism which is non-virulent for the guinea-pig may be in reality virulent for a man; and the second is the assumption that a non-virulent strain from the throat of a healthy carrier may become virulent on longer residence in the throat of that carrier, or may acquire virulence when introduced into the throat of another individual.

The authors in question made a study to determine: 1. whether the introduction of avirulent diphtheria bacilli into the throats of healthy human beings will result in the production of the carrier state and, if so produced, how long it may last.

2. To determine whether the lodgment and growth of the bacilli may be prevented by the previous injection of diphtheria antitoxin.

3. To determine whether the organisms introduced are capable of producing (a) clinical diphtheria; (b) any subjective symptoms; (c) any objective signs in the appearance of the throat.

4. To determine whether any cases of clinical diphtheria develop in the associates of artificially produced "healthy carriers" of virulent diphtheria bacilli.

5. To determine whether the organisms introduced into the throats of normal human beings are in any way changed, particularly as to morphology, staining characteristics, cultural characteristics, and ability to produce toxin.

Five physicians volunteered to be subjects of the experiments, for the details of which I must refer the reader to the original article.

The following is a summary of the results of their observations: "The results of this experimental inoculation of the throats of human beings with avirulent diphtheria bacilli are in entire accord with those obtained in our previous work with healthy diphtheria bacillus carriers. The same general conclusions drawn from our earlier work have merely been confirmed and somewhat amplified."

From their observations, the authors reached the following conclusions:

1. Avirulent diphtheria bacilli retain their characteristics despite long residence in the human throat or transfer from one human being to another.

2. Avirulent diphtheria bacilli are devoid of pathogenic importance for man.

3. The carrier of avirulent diphtheria bacilli does not constitute a menace to the health of the community.

DIPHThERIA BACILLUS CARRIERS. Another study on the subject of diphtheria carriers has been made by Moss, Guthrie and Gelien.¹ They made a careful study of 800 school children and found 85 carriers. A very large proportion, nearly one-third, came from the same street address, and among the 81 children from this address, which was an orphan asylum, 32.09 per cent gave positive cultures. The organisms isolated were typical diphtheria bacilli, not pseudodiphtheria bacilli, nor diphtheroids. In some instances, pharyngitis, and enlarged or diseased tonsils were noted, but in no case was anything suggesting a diphtheritic false membrane or pathological membrane formation of any sort observed.

A study was made of the temperature of the children, and it was found that in many it was above 99° F. and in one child it was 100.6° F., although all were attending school at the time the observations were made. These elevations occurred in children showing positive cultures and in those whose cultures were negative, so that it is evident that the presence of the organisms in the throat had nothing to do with the slight elevation of temperature. None of the carriers which were studied over a period of several months developed the disease.

Virulence tests were carried out on 44 of 56 positive cultures representing pure strains from 26 of the 30 carriers found in the orphan asylum. All of the strains were non-virulent.

The conclusions which the authors draw are quite obvious. (1) That the carrier of avirulent diphtheria bacilli is not a menace to the community and that virulence tests are necessary to avoid inflicting needless hardships on such carriers; and, (2) that the positive throat culture, an elevation of temperature and a pathological throat condition without definite membrane formation are insufficient evidence on which to base a diagnosis of diphtheria with entire certainty.

THE PRESENCE OF DIPHThERIA BACILLI IN THE EAR DISCHARGES. Davidsohn and Heck² have made a study of this subject making cultures from 100 infants in an institution. Nine of these children had no pus in the ear, and none of these showed the presence of diphtheria bacilli. All the other children were suffering from a purulent otitis media. In 28 cases, that is to say in 30.8 per cent, diphtheria bacilli were demonstrated. Cultures were made from these children and the organism obtained eventually in pure cultures for further study. In smears, organisms resembling the diphtheria bacilli were frequently found, especially in cases in which the skin around the ear was also involved.

Without going into the details of their studies of the cultures in animals, it may be stated that in a very considerable number of cases of otitis media, true diphtheria bacilli were demonstrated, some of which were found to be virulent and some avirulent. Whether the presence of the diphtheria bacilli in these cases was the cause of the involvement or not is an open question. According to the literature, ear diphtheria is very rarely met with and in none of the cases was there any membrane or any unusual destruction of the middle ear, so that it is highly probable

¹ Johns Hopkins Hospital Bulletin, April, 1921, p. 109.

² Berl. klin. Wechnschr., August 29, 1921, p. 1040.

that the organisms found were not the cause of the inflammation but are to be regarded as a secondary infection. In no cases did they observe any of the toxic manifestations so frequently met with in true diphtheria. In young children in institutions the general health is liable to be poor and inflammation of the middle ear frequent and usually of long standing. In the cases under consideration, the course of the children showing diphtheria bacilli was approximately the same as those in which they were not found, but in the particularly resistant cases, those having discharge for three months or more, it was almost always possible to isolate the diphtheria bacillus.

The cases are treated by syringing the ear with formalin solution which gradually causes the disappearance of the organisms. Diphtheria serum was not given, inasmuch as the authors found that it had no influence on similar infections noted in the nose, where there were no toxic manifestations of diphtheria.

The study of resistant middle ear infections, with reference to the presence of diphtheria bacilli, is well worthy of consideration, as it is possible that some of these children acted as diphtheria carriers without being suspected.

LARYNGEAL DIPHTHERIA. In spite of all that has been written and said about diphtheria, it remains a formidable disease which still figures in the mortality rates in a very much larger proportion than ought to be the case when we consider that we have not only an effective method of prevention but an efficient cure providing the diagnosis is made early.

Hogan¹ has contributed a short study of laryngeal diphtheria as it occurred in Baltimore. In the years 1919-1920, there were 246 deaths due to diphtheria of various types. Of this number, 202, or 82.11 per cent, were laryngeal diphtheria. Previous to January 1, 1918, the type of diphtheria was not specified on the death certificate. Of the patients who died of laryngeal diphtheria, 101, or 50 per cent, were intubated. Five died while intubation was being attempted; in 1 case permission to intubate was refused. In only 170, or 83.74 per cent, of these fatal cases was antitoxin administered, the maximum dose being 100,000 units and the minimum 2000. In 44.6 per cent of these deaths, the duration of the disease was more than three days. Hogan believes, if these cases were treated in hospitals where a trained resident was in constant attendance to reintubate when necessary, and if intubation be performed at once in all cases in which it is indicated, that the results would be very much better than they are at the present time. He gives an interesting table showing the relation of the physician's first visit to the percentage of death, and nearly 50 per cent of the deaths took place within twenty-four hours of the physician's first visit, which would seem to indicate that in a large number of cases the physician was not called until the disease had made a very considerable headway.

The whole subject of diphtheria as a cause for disease and death needs reëmphasis as the profession of this country are not fully alive to the possibilities of its prevention or cure.

¹ Journal of the American Medical Association, August 27, 1921, p. 662.

TRACHEAL DIPHTHERIA. The comparative rarity of primary tracheal diphtheria is sufficient to warrant noting the case reported by Lawder.¹ His patient was a female child, aged one year and five months, whose illness dated from the morning on which she was admitted to the hospital. On admission, it was found that the cervical lymph nodes were enlarged on both sides; breathing was very difficult, with no evidence of any intrapulmonary lesion; the color was good but no voice. Thirty thousand units of antitoxin were injected and, as the dyspnea became very bad, intubation was performed. The operation gave no relief, and an unsuccessful attempt was made to remove the membrane through a tracheal opening. The next morning the condition was somewhat better, and fifteen thousand units of antitoxin were injected. The child coughed up large quantities of mucus during the next five days and the breathing became easier. The tube was removed nine days after insertion, but had to be reinserted. The tube was finally dispensed with about a week later, and, while the tracheal wound healed satisfactorily, the voice did not return until about two weeks afterward.

THE HEART IN DIPHTHERIA. A study of 242 patients suffering from diphtheria of varying severity and extent has been made by S. Calvin Smith.² The study is based on clinical observations and cardiographic observations. The greater number had a rapid heart on admission, and 72 per cent recovered without any further evidence of cardiac disturbance. In 28 per cent, however, disturbances in the pulse were noted and some of the patients showed signs of grave cardiac disturbance due to disturbances of the conduction system reflected in the pulse. These pulse abnormalities Smith divides into the initial tachycardia and the irregularities of convalescence.

The initial tachycardia begins with the appearance of the diphtheritic membrane, and usually subsides within forty-eight hours after antitoxin has been given. This initial increase in heart rate is often of serious import when it persists during convalescence, when it may be regarded as the probable forerunner of heart block. Six or eight days after the administration of antitoxin, when convalescence is established, irregularities of the pulse may be expected, according to Smith, in 28 per cent. From a study of the cases under observation, it was found that 65 per cent of these consist of sinus arrhythmia and of the condition called sinoauricular block. Twenty per cent consist of premature contractions, but in none of these are there any signs or symptoms of disturbance of the circulation nor are they followed by any serious diseases. The remaining 15 per cent of convalescent irregularities consist of high grade heart block, sudden in onset, with marked cardio-circulatory symptoms, and these patients' deaths may be expected within thirty-six hours. None of the patients in Smith's series recovered.

Smith goes on to state that sinus arrhythmia is physiological in childhood and it is probable that the pulse irregularities defined as sinoauricular block are also physiological. It is important to emphasize the fact that acute heart block was not observed in any of the patients in

¹ *The Practitioner*, 1921, **106**, 375.

² *Journal of the American Medical Association*, September 3, 1921, p. 765.

whom early diagnosis was followed by the immediate injection of antitoxin, another reason, if any be needed, for the early diagnosis and treatment of this disease.

The carelessness exhibited by some physicians, both as regards the diagnosis and the administration of antitoxin, is, to my mind, one of the most remarkable manifestations of the human spirit.

Smith noted that diphtheria antitoxin temporarily stimulates the rate of the heart and decreases, rather than increases, certain pathological waves of the electrocardiogram. He makes some suggestions in the care of these patients. He believes that the hope of preventing serious and probably fatal heart complications lies in four procedures: The administration of antitoxin in sufficient dose by the intravenous route within the first twenty-four hours of diphtheritic invasion, followed by absolute rest for at least a week after the disappearance of all clinical symptoms and signs. To prevent anaphylaxis the use of a desensitizing dose (0.5 cc) given subcutaneously and used before the therapeutic dose, is to be recommended. The patient should be under observation for several weeks following diphtheria even though the appearance is normal, and in every instance the return to the full amount of exercise should be done very gradually.

Smith believes that the institution of cardiac classes, such as obtained in some cities, should be in use in all schools. These children should have limited hours of study, with stated and regular periods of play and rest, and be excused from the routine gymnastics, fire drills, and so on.

As regards the use of drugs, atropine is of doubtful use, and digitalis is contraindicated. The use of repeated doses of adrenalin may be of value in tiding the heart over a critical period and strychnine may be of value through its stimulating effect on the adrenals. In the later days of convalescence, caffeine may be used, and systemic tonics such as iron, quinine and strychnine.

THE TREATMENT OF THE TOXEMIC STAGE OF DIPHTHERIA. Some studies on this subject have been made by Harding.¹ She states that the clinical condition of a patient in the toxemic stage of diphtheria closely resembles that of a patient suffering from wound shock or from the results of a severe hemorrhage. Clinical observations made on the toxemic stage show a reduction in heart action, with changes in the blood-pressure; a condition resembling slight edema, which Harding refers to as "lymph-logging;" an increase in the specific gravity of the blood to such a degree as to indicate that a large part of the fluid portion of the blood must have leaked out of the bloodvessels, as there is usually, in severe cases, no increase in the flow of urine and no diarrhea.

Harding has also studied the changes in the adrenals in patients dead of diphtheria. There were marked pathological changes in these glands. In some, the changes in the cells had gone on to actual destruction. Harding believes that these changes are responsible for the persistent low blood-pressure prevalent after the toxemic stage is passed, and that the lassitude and lack of energy and the changes in circulation, namely,

¹ *Lancet*, April 9, 1921, p. 737.

the systolic blood-pressure normal and the diastolic blood-pressure low and undue rise in heart rate on slight exertion, are due to a combination of changes of the adrenals and in the myocardium.

Harding has made a large number of observations on animals using the diphtheria toxin which do not, however, reproduce the changes seen in the course of clinical diphtheria exactly. She suggests that blood transfusions should be used in the treatment of these toxemic cases and under the usual precautions, 160 cc to be given a child one year of age, if the weight is average—200 at two years; 300 at four years; and 400 at six years. In order to do a satisfactory transfusion, it may be necessary to resort to a general anesthetic, which, I should think, would be a questionable procedure in a severely toxemic patient. Harding makes the suggestion that this transfusion be repeated every twenty-four hours until three or four injections have been given, depending on the severity of the case. She especially emphasizes the need of great care, the giving of the fluid at body heat, and, in the severer cases, to warm the patient and also warm the arm where the injection is to be made. She believes that transfusions of blood are found to be far superior to injections of saline solution, which gives more temporary relief. She also tried the affect of gum saline solutions, such as have been used in wound shock, that is a 0.6 per cent gum acacia in normal salt solution.

THE MANAGEMENT OF DIPHTHERIA. Weaver,¹ after a study of a series of 147 fatal cases, makes a number of recommendations that are worthy of consideration. He believes that a great deal is still to be done in the education of the public in the matter of having every case of sickness attended with sore throat or with laryngeal symptoms, promptly investigated. This education should not only be extended to the laity and to nurses, but even to physicians themselves, who are often exceedingly lax in their examinations of throats and so allow the disease, which in most instances should be recognized, to go untreated for several days. Inasmuch as, from the standpoint of complications at any rate, the administration of antitoxin after the fourth day has but little effect, its early use should be urged in all suspicious cases without waiting for cultures or in spite of negative cultures, when the clinical appearance of the throat justifies it. He makes another interesting suggestion and that is that it might be wise to discontinue the issue of all curative packages of antitoxin of less than 5000 units and to make 10,000 unit packages readily available. The antitoxin should be given intramuscularly or, in urgent cases, intravenously. Naturally enough, Weaver believes that the use of the toxin-antitoxin mixture will do much to reduce the incidence of the disease.

The Vienna pediatric school suggests regulating the dose of antitoxin by the weight of the patient. They give one dose averaging 500 units for each kilogram of body weight and Schick believes that where this dose is adhered to, it will be found ample in any case, and that the dosing with larger quantities avails nothing and adds to the danger of the patients developing serum sickness.

¹ Journal of the American Medical Association, June 11, 1921, p. 1651.

THE USELESSNESS OF DIPHTHERIA ANTITOXIN BY MOUTH. It would scarcely seem necessary to mention this subject but for the fact that an article by Dufour¹ has been pretty largely commented on, but not much by journals in this country. Aviragnet, Lereboullet, and P. L. Marie² have taken up this question and have shown that it is of no value whatever in the treatment of diphtheria and should not receive serious consideration by anyone.

The Charcot-Leyden Crystals in the Diagnosis of Amœbic Dysentery. Thomson and Robertson³ have given the results of the value of laboratory reports on stools in cases of suspected amœbic dysentery, and their interpretation by the clinician. The first part of their article we may pass over, although they give a brief and very clear account of the stools in the various forms of dysentery. The chief interest in the report is their studies on the Charcot-Leyden crystals which were originally described by Charcot, about 1853, as occurring in the tissues of patients who had died of leukemia. Subsequently, Leyden described similar crystals in the sputum in cases of asthma.

Both Stitt and Castellani, in their works on tropical diseases, refer to the presence of Charcot-Leyden crystals in the stools of cases of amœbic dysentery, and Stitt states that they are never found in bacillary infections. Acton,⁴ in 1918, noted that the association between Charcot-Leyden crystals and *Entamœba histolytica* is very high, occurring in about 20 per cent, and he believes that the presence of these crystals in the stools, even in the absence of amœbæ, is indicative of amœbic dysentery. Thomson and Robertson state that the crystals in the stools are characteristic, elongated, octahedral shape, which has been aptly termed the whetstone shape. They vary greatly in size, but the shape is fairly constant. In the fresh stool they are easily picked out because they are highly refractile and because they are colored a clear, faint, greenish shade. They are insoluble in tap water or distilled water at room temperature; insoluble in alcohol, ether, glycerin, xylol or formalin. In acids and alkalies they are fairly easily soluble. They stain readily with eosin. These observers found the crystals in 25 per cent of the cases and believe that the reason that their figures are higher than those of Acton is that most of their cases are infections of long standing.

This is a contribution of very considerable value and, if other workers confirm it and do not find too many exceptions, it will become part of the laboratory clinical knowledge that is of practical value.

Epidemic Encephalitis. This disease has continued to hold the center of the stage very much after the manner in which it did last year, at any rate as far as medical literature is concerned. There is scarcely an issue of any medical journal these days that does not contain one or more articles or notes concerning it, and this is very much as it should be as the disease is one of such protean manifestations that it will only be by

¹ Archives médico-chirurgicales de Normandie, 1921, No. 11, 246.

² Bulletins et Mémoires de la Société Médicale, July 28, 1921, p. 1160.

³ Proceedings of the Royal Society of Medicine, Section of Tropical Diseases and Parasitology, September, 1921, p. 33.

⁴ Indian Journal of Medical Research, October, 1918.

much writing and reading about it that the medical profession will be keenly alive to it. No disease has done so much to upset our preconceived ideas of diagnosis particularly of nervous and mental diseases. I have not attempted to abstract or comment upon anything like all the reports but have picked those which seemed to me to be of most importance or of most interest. On all the topics mentioned, one could readily add a half dozen or more references.

EPIDEMIC ENCEPHALITIS IN THE UNITED STATES. H. F. Smith,¹ has made a collective study of this disease. He starts with a short account of the history but, as is usually the case, this is fragmentary and unsatisfactory. A very delightful account of the history of this disease in the earlier literature will be found in an article by Crookshank.² The cases of involvement of the nervous system in the epidemic of 1899-1890 have been very satisfactorily studied by Leichenstern.³ As far as this country



FIG. 1.—Chronological occurrence of epidemic encephalitis in the United States, 1918-1919. (Smith.)

is concerned, one of the best analyses was made by Church.⁴ In the United States in the recent epidemic there were 255 cases of encephalitis reported from September, 1918, to May, 1919. They were from twenty-two states including every section of the country. On careful study 39 of these cases were excluded as they were found to be cerebrospinal fever, cervical syphilis, brain abscess, tuberculous meningitis, epilepsy, poliomyelitis, hysteria and in one instance acute alcoholism. The first case was reported in August, 1918, and had a gradual increase in cases until December, when the incidence rises rapidly, reaching its apex in March, and falling rapidly, so that in April the number of cases reported about equalled those of December. The age distribution is very interest-

¹ Public Health Reports, February 11, 1921, p. 207.

² Boston, Medical and Surgical Journal, 1919, 182, p. 34.

³ Deutsch. med. Wchnschr., 1890, 16, 209.

⁴ Chicago Medical Record, 1891, p. 418.

ing and particularly so in view of the fact that there are some who believe that encephalitis and poliomyelitis have a common origin. In poliomyelitis the greatest number of cases are in the first four years, while in encephalitis most of the cases occur over twenty. An illustration used by Smith, which is here reproduced, shows this graphically. Church also gives a table and figure showing the incidence of encephalitis and influenza. While the age incidence of this disease does not coincide, the difference between the two are not very marked as would be noted in the accompanying chart. Theoretically, if the two diseases were due to the same cause, the incidence as compared to the total population, should correspond; practically, I do not think that one would expect to find this,

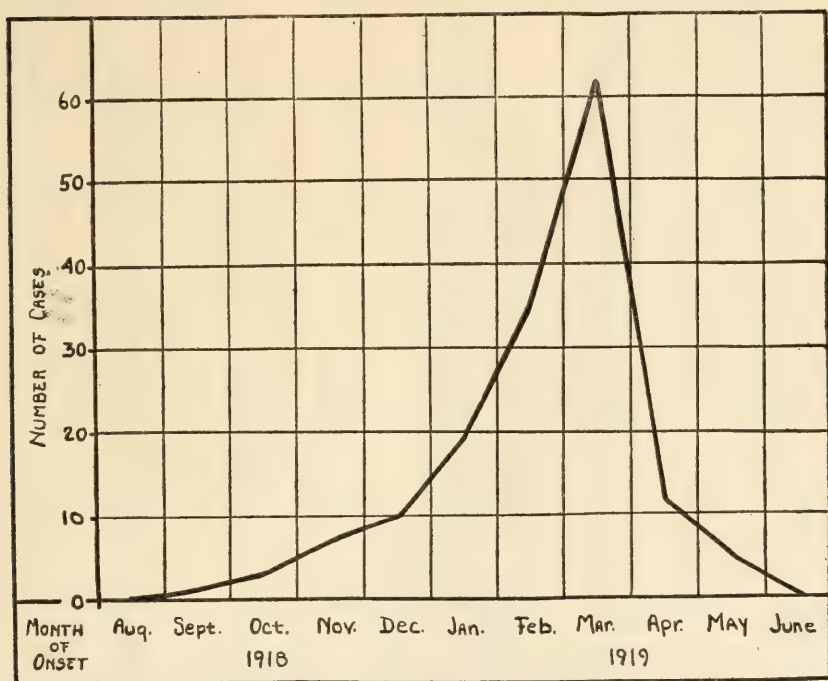


FIG. 2.—Occurrence of epidemic encephalitis in the United States plotted by month of onset. (Smith.)

but the chart as it stands nevertheless will be used to point out that the diseases are entirely distinct, and those who hold this view question the association on the ground that the resistance of a very large number of individuals is lowered.

I devoted so much space last year to a consideration of the symptomatology of the disease that it will not be necessary to comment on Smith's statement, but his chart showing the percentage of total cases in which the various symptoms were present, will be found worthy of study. Smith concludes that clinically the disease presents a series of symptoms which are found in any other infection. He is of the opinion that the determination of the length of the incubation period is impossible at the

present time. His conclusions regarding communicability are very striking. Approximately 900 persons were exposed in the immediate families of the cases reported in the United States, and, among this number, no secondary case occurred so far as reports and inquiries show (see Contagiousness of Encephalitis).

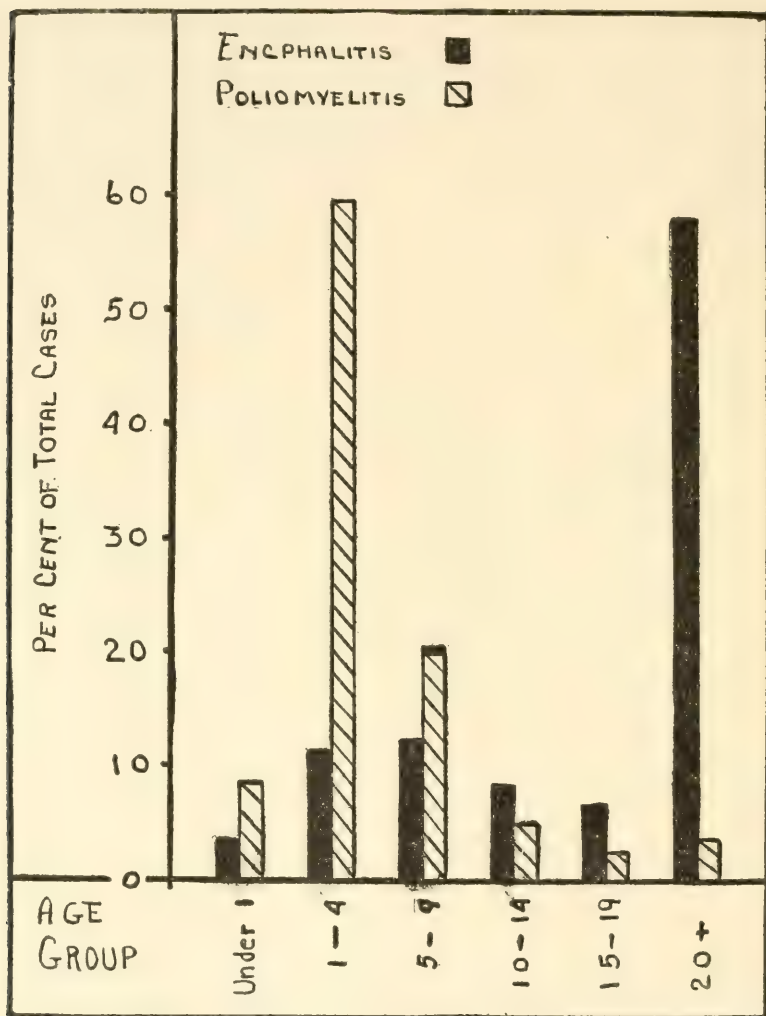


FIG. 3.—Comparative age distribution of epidemic encephalitis and poliomyelitis. (Smith.)

VIRUS IN THE CEREBROSPINAL FLUID. Kling, Davide and Liljenquist¹ have given an account of some studies made with reference to the nature of the virus of the disease. They believe it to be a glycerin resistant,

¹ Hygiea, Stockholm, September 16, 1921, No. 17; Abstract Journal of the American Medical Association, November 12, 1921, p. 1613.

filtrable, invisible organism which cannot be cultivated. Four rabbits were inoculated with the cerebrospinal fluid obtained by lumbar puncture

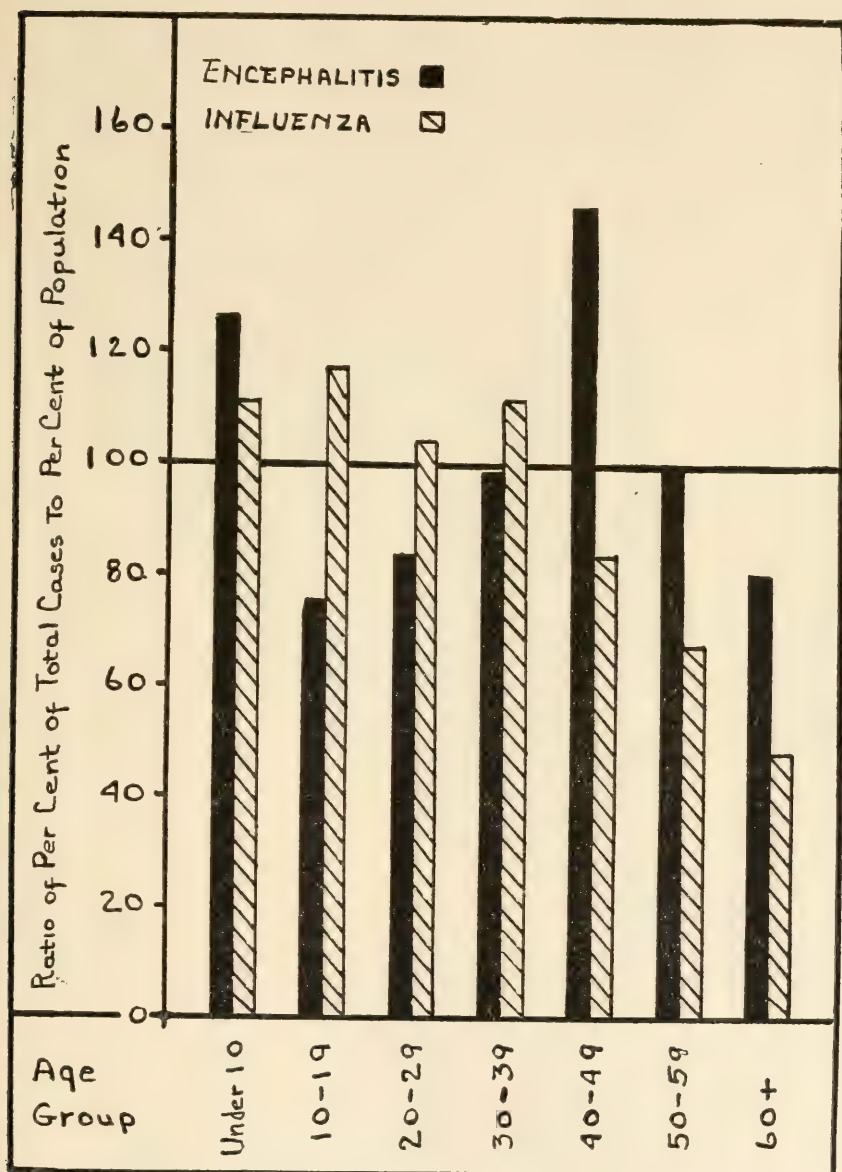


FIG. 4.—Ratio of the percentage of total cases of epidemic encephalitis and of influenza to the percentage of population in various age groups. (Smith.)

in a typical case that showed no symptoms. Thirty-eight to forty days later the animals were killed and the brains of two seemed to be normal, but the other two showed pronounced characteristic lesions typical of

epidemic encephalitis. Five other rabbits were inoculated with the brain tissue from these two, and two killed on the twenty-fifth day showed microscopical changes. The authors believe that this test may be developed into a method of demonstrating the occurrence of the disease, but that a negative result may not be considered conclusive.

THE HISTOPATHOLOGY OF EPIDEMIC ENCEPHALITIS. Various observers have made reports on the histopathology of this disease, and of especial significance is the preliminary note of Da Fano.¹ He was able to demonstrate in the nervous tissue, both within and without the nerve cells, very minute particles for which he proposes the term



FIG. 5.—Frequency of occurrence of clinical symptoms in epidemic encephalitis. (Smith.)

“minute bodies.” These have the appearance of consisting of a central general basophile particle and of a delicate little stainable body irregularly round or oval in shape. These bodies are generally discrete and provided with one granule, but dumbbell-shaped forms occur as well as others with two central particles arranged in pairs. There seems to be some relation between these forms and the granular pigment-like material occurring within the nerve cells in places where brown or black pigment is not generally found. Similar minute forms have been found within and without the cells infiltrating a salivary gland from an acute

¹ British Medical Journal, January 29, 1921, p. 153.

case of the disease. In discussing these bodies, certain possibilities have occurred. One, that they were the product of an optical illusion, associated perhaps with degenerative changes caused by the disease, or that they may be due to the presence in the tissues of a living agent, the cause of the disease.

EXPERIMENTAL STUDIES. In 1919, Loewe, Hirshfeld and Strauss reported the finding of a filtrable virus in cases of epidemic encephalitis. Subsequently, Loewe and Strauss reported the results of inoculating rabbits and monkeys with blood, spinal fluid, and filtrates of nasal washings. A large number of the animals so inoculated died, and the central nervous system showed typical lesions of encephalitis. They were also able, by using the method of Noguchi, to cultivate a minute organism closely resembling the so-called "globoid bodies" described by Flexner and Noguchi from cases of epidemic poliomyelitis.

Later, similar observations were reported by Levaditi and Harvier, and by McIntosh and Turnbull.

Thalhimer¹ has made a study of material from 4 cases of epidemic encephalitis, 2 of the fulminating type, 1 with marked myoclonus and 1 of the usual lethargic type. Some 200 rabbits have been inoculated intracranially through the thin temporal plate, according to the method devised by Loewe. The results obtained by Thalhimer are identical with those reported by Loewe and Strauss, both as regards their animal observations and the growth of a culture on a specially proper medium. The organism obtained by Thalhimer is extremely minute and passed through the Berkefeld filter. He believes that taking into account his own observations and those just referred to, that it may be assumed that epidemic encephalitis is in all probability caused by this organism.

CEREBROSPINAL FLUID IN ENCEPHALITIS. Findlay and Shiskin² have made a study of encephalitis in childhood with particular reference to the changes taking place in the cerebrospinal fluid. Their findings with regard to the cell content, the sugar content, and bacterial infection, were similar to those obtained by other workers. The fluid is clear in all cases, under normal pressure in some and in others under considerable pressure. Sugar was present in all cases, Fehling's test being used. They did not do any quantitative test so the finding of Dumolard and Aubry³ of an increased amount of sugar was not confirmed. The cell counts were all low, none exceeding twenty, and in the majority there was only an occasional mononuclear to be seen. The specimens were all sterile. In 21 out of the 24 cases Lange's colloidal-gold test was made, and in 4 was normal. The fluids which showed abnormal reactions gave changes similar to those seen in syphilis, that is as precipitation occurs in the tubes in low dilution.

Davies and Krous⁴ found positive curves, some of the paretic and some of the luetic types, and at the Phipps Psychiatric Clinic typical paretic

¹ Archives of Neurology and Psychiatry, February, 1921, p. 113.

² Glasgow Medical Journal, January, 1921, p. 18.

³ Bull. et. Mem. d. l. Soc. Med. d. Hôp. d. Paris, 3 s, 1920, No. 44, p. 317.

⁴ American Journal of the Medical Sciences, 1921, 161, 109.

curves were obtained from the fluids of patients admitted on account of mental symptoms during encephalitis.

Other observers, as McCaw, Perdraw and Stebbing,¹ found an increase in the lymphocytes in 3 out of 6 cases examined. There does not seem to be much relation as regards the number of cells and the stage of the disease, but Boveri and Netter both state that increase is more likely to be met with in the earlier stages.

THE CONTAGIOUSNESS OF ENCEPHALITIS. Roger and Blanchard² have collected some instances of what they regard as direct infection, which are of extreme interest in view of the fact that in the majority of instances, as noted above, there has been no history of secondary cases. Netter reported a family epidemic in which a child of three fell ill with the disease and at the end of one month his sister, aged six, and at the end of six weeks a nursing infant of five months, both of whom slept in the same room, were taken with the same symptoms. Netter also gives the case of two families where a father and a daughter were taken within three weeks of each other. He also gives instances from other observers of somewhat similar occurrences.

Levy also describes a family epidemic where 3 children in the same family were taken one after the other, in spite of the fact that the first case was carefully isolated.

Guillain and Lachelle published a case in which they believed the contagion was transmitted by intermediary objects. A man died in February, 1920, of myoclonic encephalitis. His son was taken with the disease in September after having lived fifteen days in the room which had been occupied by his dead father and also after having worn his clothes. This of course is all rather fanciful and scarcely deserves serious consideration as other methods of infection are not eliminated.

Roger and Blanchard relate the following instance occurring in their own experience: A soldier developed the disease November 30, 1920, and died December 12. This led to overlooking the regiment for other cases and it was found that another soldier who occupied the same room had been affected about the same time.

SEASONAL OCCURRENCE. Netter³ and the commission to which he is attached, have studied the seasonal occurrence of encephalitis and they noted that since 1916 the disease always began to increase toward the end of the year, reaching its height in February and diminishing from that time until sometime in the summer, when the lowest point is reached. This seasonal occurrence he points out as similar to that seen in cerebrospinal fever and pneumonia, that is in definite contrast with the occurrence of poliomyelitis, in which the greatest number of cases are seen during the hot months, namely July, August and September.

TRANSMISSION OF ENCEPHALITIS THROUGH THE PLACENTA. The subject of the transmission of encephalitis from the mother to the child is one which has received a certain amount of attention. Among other

¹ The Lancet, 1918, 1, 616.

² Bulletins de la Société Médicale des Hôpitaux, Paris, January 21, 1921, p. 40.

³ Bulletin de l'Académie de Médecine, March 8, 1921, p. 278.

reports may be mentioned the contribution of Mercier, Andrieux and Bonnaud,¹ and of Jorge.² Levaditi, Harvier and Nicolau³ have established the fact by ample observations that the virus of encephalitis may be transmitted through the placenta. Clinically, there is a case of Harris⁴ who observed a child born at term who showed great somnolence and retention of urine but who eventually recovered. Novaes and Sousa report a case of a newborn infant with myoclonia and small hemorrhages who recovered at the end of five days. Achard⁵ points out that while placental transmission is possible, it is not necessarily the rule, and he reports a case in which a pregnant woman in whom the diagnosis was verified by autopsy was delivered of a fetus whose brain showed no lesions of the disease whatever.

ENCEPHALITIS IN PREGNANCY. There have been so few contributions on this subject that any addition to our knowledge is welcome. Last year I called attention to the fact that Schulze had collected 7 cases in literature and added 1 of her own. The disease is more frequent in men than in women, but if it occurs during pregnancy, the mortality rate seems to be unusually high. In the 8 cases just referred to, 1 recovered, 5 died, and in 2 the outcome was not stated.

Banister and Sophianopoulos⁶ reported an additional case in a primipara of thirty-one, in the thirty-sixth week of pregnancy. The first symptoms noted were heaviness about the eyes and insomnia. A few days later she complained of being unable to keep awake, with great pain when she raised her eyelids, and of slight tremor in the hands. The case progressed to a typical severe encephalitis. The condition became so serious that on the sixteenth day of the disease labor was induced and a perfectly healthy child born. The patient's condition was slightly improved after delivery, but after a few days became much worse, and she died three weeks after the onset of the disease. There was no autopsy. The question of inducing labor in this case is one worthy of further study. It seemed in this instance to have the merit of keeping the baby alive and, of course, gave the hope of bettering the mother's condition.

Marinesco⁷ reported 2 instances of encephalitis occurring during pregnancy. The first was a patient, aged thirty-two, who entered the clinic for nervous disease in the fifth month of her pregnancy in a state of torpor. She had rapid involuntary movements of the face, arms and legs, and bilateral ptosis and fever. The disease had started two weeks before with diplopia, violent pains in the left arm, digestive disturbances, and insomnia for three nights following which the patient fell into a condition of somnolence, from which she could be aroused only with difficulty. The histological examination of the nervous system and specimens from this patient showed marked changes in the cervical

¹ Bulletin de l'Académie de Médecine, May 31, 1921.

² Paris Médicale, June 4, 1921, p. 454.

³ Comptes rendus de la Soc. de biol., May 28, 1921, p. 957.

⁴ Lancet, April, 1918.

⁵ Bulletin de l'Académie de Médecine, June 7, 1921, p. 645.

⁶ The Lancet, March 5, 1921, p. 481.

⁷ Bulletin de l'Académie de Médecine, July 12, 1921, p. 34.

region. The fetus showed no signs of maceration. In the central nervous system of the fetus, and in the medulla there was marked dilatation of the smaller vessels and small capillary hemorrhages. The vessels were filled with leukocytes. There were also changes in the basal ganglia. Marinesco considered these lesions as evidence that the action of the virus had extended through the placenta.

His second observation was a multipara, thirty-one years of age, pregnant seven months, who was admitted to the hospital in profound torpor, and responded with difficulty to questions if asked in a loud voice. During the time in which she was aroused, there was ptosis, and strabismus. The disease had begun five days before with a violent headache, loss of appetite and fever. There were rapid, irregular movements of the muscles of the face and extremities, but without producing any movement of the latter. The condition of the patient became grave and a Cæsarean section was done without an anesthetic. The fetus was extracted in an asphyxiated condition and died after several inspirations. The mother survived only a short time, passing into a deep coma the following day.

ENCEPHALITIS IN CHILDREN. Among them the contributions on this subject is a short, but notable, article by Neal,¹ whose contributions are always very much worth while.

Neal has studied 274 cases, of which exactly half, 137, were fifteen years of age or younger, and 112, or 40 per cent of the total series, were ten years of age or younger. The following table shows the age of distributions:

Age.	Number of cases.
3 months	4
From 3 to 6 months	4
From 6 to 12 months	8
From 1 to 2 years	20
From 2 to 5 years	29
From 5 to 10 years	47
From 10 to 15 years	25
Total	137
From 15 to 20 years	15
From 20 to 30 years	56
From 30 to 40 years	33
From 40 to 50 years	24
Over 50 years	9
Total	274

It is very interesting to note that, as contrasted to these, in 65 per cent of cases of epidemic meningitis and about 90 per cent of cases of poliomyelitis, the patients are under ten years of age. The distribution as regards sexes shows about 50 per cent more males than females, which is also true of epidemic meningitis and poliomyelitis. The maximum number of cases are in the first three months of the year. In New York City a study of sporadic cases of epidemic meningitis shows that the maximum number occurred in April, May and June, while poliomyelitis

¹ Journal of the American Medical Association, July 9, 1921, p. 121.

as a rule shows the greatest number of cases during the hot months. Neal believes that very few people are susceptible to the disease, inasmuch as in only one instance did she see two cases in a family.

As regards the symptomatology, in Neal's experience there was little difference from the disease as seen in adults. There is a tendency to have a sudden onset, and the course of the disease is ordinarily not as long, but the mortality is approximately the same. Lethargy is present in many cases, but excitement, insomnia, and delirium are not infrequent. Sometimes the delirium lasts for ten or fifteen minutes and is repeated at frequent intervals. In younger children, convulsions are not uncommon. There are a great many different ocular disturbances, double vision, blurring of vision, blindness, ptosis, which may be either unilateral or bilateral, strabismus, nystagmus, and sometimes other curious motions of the eyes. In some there are changes in the voice, usually a patient speaks in a slow, monotonous tone, with some delay before answering questions. Some patients are extremely talkative. Among other changes noted by Neal is profuse sweating, which is of rather frequent occurrence. In her experience, too, typical meningeal symptoms, such as stiffness of the neck and Kernig's sign, were not common unless associated with some degree of general spasticity.

In her experience, the course of the disease varied from two or three weeks to many months, but I believe it is generally experienced that the prolonged cases are less common in children than in grown people. Neal also calls attention to the fact that the course of the disease is marked by sudden, rather transitory changes, either for the better or for the worse, and cautions against making a prognosis from one inspection of the patient.

The blood counts vary from normal to a leukocytosis up to 15,000 or 20,000. The most valuable information is obtained from the examination of the spinal fluid which presents practically the same appearance as that seen in poliomyelitis. The fluid is clear, the amount somewhat increased. The cell count is normal or, as in most cases, shows a slight increase in cells, usually from 100 to 150, though Neal records one count as high as 1500. In most instances the mononuclears predominate but, as in poliomyelitis, the polymorphonuclears may be greatly increased instead. There is usually a slight increase in albumin and globulin, while the reduction of Fehling's shows the glucose to be present in normal quantity. Some observers, notably Foster,¹ have found slight increase in the glucose. Similar findings may occur in poliomyelitis, in brain abscess, brain tumor and in syphilitic conditions of the central nervous system, but in the latter the Wassermann reaction and the colloidal-gold test are of value. In very early tuberculous meningitis these findings may also be present. The absence or a diminution of glucose points to tuberculosis meningitis, the presence or increase to encephalitis.

In addition to the article by Neal, there have been a host of articles by various observers throughout the world and there have been several

¹ Journal of the American Medical Association, May 7, 1921, 76, 1300.

reviews dealing with this subject, notably one by Comby¹ and a general review² of the same subject. Whether the cases of acute encephalitis that have been described from time to time in children is the same disease as we are dealing with at the present time is difficult to say. If it is not a separate disease entity, there are certainly very many points of similarity. Almost every year since 1900 there have been one or more articles on this subject and one or two extensive studies, particularly by F. Raymond and his pupils. Among them, one by Marsh³ who reported 4 cases with tremor which resembled a cerebellar ataxia, Parkinson's disease or multiple sclerosis; Higier⁴ described 4 cases of acute encephalitis in children showing either paralysis or ataxia and disturbances of the eye muscles; Guinon⁵ reports 2 children, 1 of whom had an athetosis and the other what he describes as a chorea and acute ataxia, both following acute encephalitis. It is very important in dealing with these cases to exclude those which might be due to syphilis.

About 1918, the number of cases increased remarkably, some sporadic, and in some places small epidemics occurred in connection with the disease as seen in older individuals. Griffith⁶ reported 4 cases under the title of acute cerebellar ataxia. These showed scanning speech, tremor, nystagmus, and loss of equilibrium. In 2 children this followed what was supposed to be grippé, and, in 1, measles. The other came on without apparent cause. Many of these cases were also formerly described as a cerebellar form of poliomyelitis or an encephalitic form of the same disease. The recognition of an acute encephalitis makes the differential diagnosis of these acute brain conditions in children exceedingly difficult, and many times impossible.

Another study on encephalitis in children is by Moore.⁷ He studied 28 cases, 13 in boys and 15 in girls. Twenty-two were the somnolent type, and 6 were the irritable. In 9 of them there had been some preceding illness, such as pharyngitis or diarrhea. There was complete recovery in 13 of his cases, 7 showed a partial recovery, and 6 died. The number of somnolent cases is a little higher in this series than in those of the other observers. Moore stresses too much the syndrome characterized by the triad of lethargy, ocular palsies and fever. There are certainly many cases in which other parts of the nervous system are affected which should be classed as epidemic encephalitis. One of the difficulties in diagnosis has been that so many writers have emphasized the characteristic clinical picture and have not made sufficient of the large number of more or less irregular forms of the disease.

Happ and Mason⁸ give a good description of the disorders of motility which are so diverse that it is practically impossible to classify them in well-defined groups. They make three headings, however, (1) disorders of tonicity; (2) paralysis and pareses; and (3) hyperkinetic phenomena.

¹ Archives de Médecine des Enfants, August, 1921, 24, 457.

² Ibid., p. 488.

³ British Journal of the Diseases of Children, June, 1910.

⁴ Zeitschr. f. die ges. Neur. und Psych., 1910.

⁵ Archives de Médecine des Enfants, August, 1914.

⁶ American Journal of the Diseases of Children, August, 1920.

⁷ Northwest Medicine, July, 1921, p. 176.

⁸ Bulletin of the Johns Hopkins Hospital, May, 1921, p. 137.

Under the disorders of tonicity there may be a general spasticity such as is seen in meningismus, while later there may be evidences of disturbances of the pyramidal or extrapyramidal motor tracts. Hypertonicity is often widespread and is often associated with what is described as waxy flexibility, that is, the extremities may be moved but give the sensation of one bending a piece of wax. The mask-like face is often associated with this condition. Hypotonicity is less frequently present and may be associated with ataxia or weakness of the extremities.

In the paralyses and pareses, it is not infrequent to find changes referable to either the upper or lower motor neurons. Practically, any muscle or group of muscles, or any combination, may be met with. Monoplegias, hemiplegias, paraplegias and diplegias, with exaggerated tendon reflexes and other evidences of involvement of the pyramidal tract may be seen and may vary greatly in the length of time which they last. As a rule, the duration is short and the recovery eventually complete. Any combinations of the cranial nerve palsies may be met with, but the nerves chiefly affected are the third, fourth, sixth and seventh. Dysarthria has been noted and the patients complain that the tongue feels thick and that the face is stiff. In a few instances this may be dependent on twitching of the muscles of the tongue. Difficulty in swallowing may also occur in some cases. Trismus, together with tenderness of the masseters, has also been described. There may be disturbances of the heart action, tachycardia perhaps being the most frequent change, and there may be an increase in the respiration rate and when this occurred in the cases studied by Happ and Mason there was found to be a diminished bicarbonate content of the blood plasma, but inasmuch as the administration of sodium bicarbonate did not relieve this in some, it seems certain that the disturbance was dependent on changes in the central respiratory regulatory mechanism. There are sometimes cases in which there is symmetrical paralysis of the peripheral nerve type, with a gradual onset and extensive flaccid paralysis of the upper and lower extremities, more markedly in the distal portions, with slight sensory disturbances, muscular atrophy, and usually slow but eventual recovery.

Under the heading of the hyperkinetic phenomena are grouped muscular twitchings, true fibrillary tremors, coarse tremors, myoclonia, that is rapid, rhythmical contractions of a muscle or a group of muscles either with, or without, movement at the joints; and choreiform movements, sometimes indistinguishable from acute chorea. Convulsions are frequent in young children particularly at the onset, but they sometimes occur in the course of the disease. Hiccough is also sometimes encountered in children. Sensory disturbances are not so frequent in the early stages but there may be a general hyperesthesia probably due to meningeal irritation. This is usually of short duration. Headache may be present, and there may be radiating pain not unlike the lightning pains of tabes, and patients who have this, not infrequently later on develop choreiform or myoclonic movements. Numbness is occasionally complained of, sometimes half the body or other times some part of it being affected. Sweating is a very common thing, and sometimes it

may be limited to portions of the body. There may not be disturbances of the sphincter, of the bladder and rectum.

Psychic disorders may be noted, particularly during convalescence, inability to concentrate, mental fatigue after slight effort, irritability, disobedience, changes in disposition are most common. There may be a condition of mental instability, with uncontrollable laughter or crying, and occasionally there may be definite delusional or confusional psychoses.

Insomnia as a late symptom is quite common in children. During the daytime the child may be more or less drowsy, but as night approaches the child becomes restless and excited, will not obey, and when put to bed does not get to sleep, but shakes the bed or talks or sings and spends the night in all sorts of activities. During convalescence there may be also various disturbances, such as are seen in the course of the disease, muscular twitchings, tremors, choreiform and athetoid movements, ties, spasticity and even paralyses. Very often there is a state of general restlessness, when patients want to be doing something all the time and usually in a very hurried manner. Occasionally, there may be a general spasticity coming on late in the disease, and Happ and Mason describe a case in which hemiathetosis was present. Another curious phenomena is increased salivation as a late symptom. Sometimes this is excessive and leads to constant spitting. Netter and others have reported this, and the former suggested the use of pilocarpine. He also has reported the occurrence of acute inflammation of the parotid gland, as have others.

THE AFTER-EFFECTS OF EPIDEMIC ENCEPHALITIS IN CHILDREN. The prognosis in encephalitis must, of course, always be guarded. While it is well known that in adults the disease frequently leaves behind it very marked changes in the nervous system, there has been a general impression that in children the end-results were very much better, so that a study of the subject by Paterson and Spence¹ is a most welcome addition to our knowledge of the subject, albeit an unpleasant one.

There have been innumerable contributions to the subject of encephalitis in children, but most of them deal more with the disease itself rather than what follows. Cruchet² studied 32 cases, 12 of which died; in all of those who recovered there was either some degree of mental deficiency, the paralysis agitans syndrome, or irregular athetoid movements. Francioni³ studied 20 cases and found there persisted insomnia, restlessness, and changes involving the conduct of the child. An interesting condition which has been described by a number of different writers was restlessness by night and somnolence by day. This condition is also described by Rosenda,⁴ Fletcher⁵ and Findlay and Shiskin.⁶ These authors report, however, that this may be regarded as a manifestation of convalescence, as recovery eventually occurred.

¹ The Lancet, September 3, 1921, p. 491.

² Bull. et Mem. Soc. Med. des Hôp. de Paris, March 17, 1921.

³ Policlinico, Sezione Practica, 1921, **28**, 575.

⁴ Ibid., 1921, **28**, 181.

⁵ The British Journal of the Diseases of Children, 1921, **18**, 69.

⁶ Glasgow Medical Journal, 1921, **95**, 18.

A condition resembling paralysis agitans has been described very frequently in grown people and has also been noted in children, Paterson and Spence including in their cases 1 in a boy of eight years of age. These authors, from a study of 25 cases are of the opinion that serious results are more liable to occur in infants and young children than in older ones. In their cases the disease when it occurred before the age of twelve months either resulted in death or in mental deficiency. They believe that the severity of the after-results are in direct proportion to the severity of the initial attack, and if the stupor and lethargy exist for three or four weeks in a young child that some degree of mental deficiency may be the effect, but if the stupor lasts only a few days that a good prognosis may be given. One of their patients, eleven months of age, was drowsy for six days and could not be awakened. The symptoms began to pass off on the seventh day and improvement was rapid. The child subsequently was found to be perfectly normal. In a series of 25 cases occurring in childhood, only 25 per cent showed a complete recovery, The mortality rate, however, was low, only 1 death in the entire series.

The mental changes vary from complete idiocy to mental deficiency. In many instances there are changes in the character and habits of the child. The most common physical changes are spastic diplegia, hemiplegia, symptomatic paralysis agitans, muscular rigidity, and tremors to which I might add athetoid movements.

TRANSITORY OBESITY IN ENCEPHALITIS. There have been some observations of extraordinary interest, particularly in the French literature, regarding the occurrence of obesity after encephalitis. Livet¹ called attention to 4 old cases of encephalitis who, as soon as the acute stage of the disease had passed off, began to take on weight rapidly, gaining from 5 to 13 kilograms. Similar observations have been made by Nobécourt² who reported on a case occurring in a young girl, and Babonneix recalled that he had seen a child who, in addition to the obesity, showed signs of hydrocephalus. Obesity following infectious diseases is rare although well known, following typhoid being perhaps the most common. In encephalitis it is also rare, Netter reporting 3 cases out of 150 patients.

Roger and Aymés³ reported on 4 cases. One case was in a young woman, aged twenty-seven years, who, toward the middle of February, 1919, showed, on the eve of her delivery, a pain in the left arm and subsequently developed encephalitis of the lethargic type. In May, she had a return of the fever, some abnormal movements of the legs, especially on the left side, with dyptopia and delirium. She had another recurrence of the disease in March, 1921, with stiffness and tremor of the left arm and contracture of the foot. In June, 1920, she had gained 7 kilograms over her ordinary weight. There was no glycosuria and menstruation was normal, so that any influence from the ovaries was out of the question.

¹ Soc. méd. des Hôp., May 6, 1921.

² Soc. de Péd., February 15, 1921, and Soc. med. des Hôp., May 20, 1921.

³ Bulletin et Mémoires de la Société Médicale des Hôpitaux, August 4, 1921, p. 1278.

The second case was in a child, aged nine years, who was attacked with fever in 1920, with choreic movements and somnolence, who had, from January to July, atonic facies, paralysis of the left side of the face, and movements of the fingers, particularly of the right hand. This child, who had been thin before, showed a swollen face and very marked obesity. When he was four years old he weighed 26 kilograms, a month after the onset he had an increase to 28, and four weeks later to 31. There was no glycosuria in this case.

In both of these cases the weight was maintained,* and in 2 other instances the same authors report a transitory obesity; 1, a young girl aged fifteen years, with a hemiparkinsonian syndrome on the right side and psychic troubles. Following an acute attack of encephalitis there had been an exceedingly rapid increase in weight without any changes in the urine. Subsequently, the obesity had partially disappeared. The second case, a man, aged thirty years, had had a Parkinson syndrome following encephalitis, with no changes in the urine. At the time of convalescence the patient took on weight very rapidly. This patient was put on a restricted diet under which the obesity disappeared, but the Parkinson stiffness was increased. At the time he was examined he showed a marked glycosuria.

The authors quoted question whether the increase in weight could be due to lack of exercise, particularly as patients with the Parkinson syndrome are not particularly predisposed to obesity. It has also been suggested that the use of arsenic was responsible, but in a series of cases in which it was used the gain in weight was not noted. Livet was of the opinion that obesity is due to changes in the hypophysis and perhaps also in the thyroid and genital glands, and questions whether organotherapy could not be instituted in encephalitis. In favor of this hypothesis is the occurrence of glycosuria or polyuria. Transitory glycosuria has been observed by numerous observers, for example, Economo, Groebels and Briand, and Rouquier.

THE PSYCHIC DISTURBANCES IN ENCEPHALITIS. There have been a large number of contributions on this subject in the past two years, perhaps as a sample I may refer to the article by Laignel-Lavastine.¹ Even in the simpler types of encephalitis where there is lethargy, the condition of somnolence is not the only disturbance of the mentality. The various conditions which may be met with have generally been classified according to the different psychic symptoms as to whether there is a predominance of lethargy, of dreams, of agitation, of catalepsy, etc. There may be all sorts of combinations of psychic and nervous disturbances, these mixed forms giving very intricate and complex clinical pictures. In the more somnolent of the lethargic forms, the patient answers questions when aroused, often with astonishing clearness. In other cases the condition resembles that seen in a drunken man, in fact this mistake in diagnosis has been made more than once. Hesnard has suggested that this form be called the drunken type, and he believes that it establishes the transition between lethargy and mental confusion.

¹ Gazette des Hôpitaux, March 26, 1921, 389, and March 31, 1921, p. 405.

In the second form, there is more or less complete disorientation, with delirium, hallucinations of sight, and sometimes a general sensibility, such as an impression of a person seated upon the chest or abdomen, sometimes ideas of persecution. As their temperature goes down, the delirium usually disappears, but the mental storm which they have passed through leaves very marked changes in the facial expression, their eyes being haggard and there being marked anxiety. This condition may alternate with short or long periods of delirium which usually finally disappear, but the expression of anguish and fright remains for a long time.

In a third group of cases there is very marked dreaming, sometimes limited to the night, but often occurring in daytime as well. This condition is accompanied with marked visual and auditory hallucinations.

In a fourth group of cases, which often follow the dreamy state, there is an active delirium resembling the alcoholic form. These frequently need restraint, and Magnan has warned particularly against the use of mechanical means in these cases, as he states the delirium patient placed in a straight-jacket means a dead man.

In a fifth group of cases there is either catalepsy, in which the certain attitudes are maintained for long periods of time, or there may be the repetition of some stereotyped movement.

The authors divide the cases with psychiatric symptoms into a number of different forms.

1. The lethargic type, to which I have already referred.
2. The delirious type.
3. The epileptic type in which there are tonic and clonic convulsions, and this form he would limit to those cases in which the convulsion is practically the only manifestation of the disease, and not to the cases in which there are convulsive movements in the course of a lethargy. Some of these cases are limited in their extent and the diagnosis of Jacksonian epilepsy has been made.

4. Maniacal type.

5. The depressive type.

6. The hebephreno-catatonic type, such as is noted in dementia precox. These patients have a sleepy aspect, with stupor, catalepsy, stereotyped movements, and they are incoherent and aggressive.

The future of these cases, or, in fact, of any case, is very important, and there may be all sorts of things left after an attack. There may be disturbances of memory, marked neurasthenic or psychasthenic conditions, with inability to work, with fatigue coming on with abnormal quickness. There may be weakness of the muscles. Tics are not uncommon, particularly in young people. In some, the psychic stages described above may persist. In children, in addition to tics there may be epilepsy, cataleptic conditions, retardation of the mental development, imbecility, even states of dementia. The mental conditions which occur in connection with encephalitis if they are not a complication of a well-recognized form, may present difficulties in diagnosis which will baffle even an accomplished alienist. The treatment of these mental conditions is very similar to those occurring apart from encephalitis and needs no special comment.

Jones and Raphael¹ have also made a report of some cases and given a short review of the literature dealing with this subject. Most of the studies that have been made upon the disease have been along neurological lines, but quite a number of observers have gone into the subject of the various mental manifestations and various psychoses have been described. Jones and Raphael state that looking at the disease from a psychiatric aspect, there seem to be two stages, the irritative stage, in which the mental picture is not unlike that of other non-infectious psychoses, and another period of stupor or lethargy, for which they suggest the name of substuporous period.

In the irritative stage there may be euphoria, hypomania, depression, hallucination, paranoid symptoms, or even the Korsakoff syndrome, and at times the condition may be not unlike severe hysterical excitement.

In the lethargic period they describe the typical extreme apathy with a mask-like face and cataleptic manifestations, and they call particular attention to the fact that, except in the terminal stage, it is usually possible to arouse the patient.

From a study of their own cases they suggest that the symptoms during the irritative stage reflect the patient's makeup previous to his infection, and that there is an amnesia for this period. In these two respects they state that the disease is characteristic of a toxic delirium. The mental condition may clear up entirely, but in some instances it does not, and may even increase in severity.

THE SYMPATHETIC NERVOUS SYSTEM. A review of this disease to which the reader may be referred but which needs no special comment is one by Lhermitte.² He has given an unusually good account of the disease in a very few pages. Among other things he calls attention to the symptoms referable to the sympathocotonic system which are more frequent than those of the vagotonic system. The former consist of a generalized hyperidrosis, as reported by Nonne, or localized to the face, as noted in reports of Kennedy and others, or in alternating vasodilatation and vaso-constriction, with reddening or paling of the skin. Eisenlohr has reported exophthalmus, and Economo tachycardia and hyperthermic disturbances. There have also been reports in cases in which there was polyuria, glycosuria and also hyperglycemia. As regards the symptoms of involvement of the vagotonic system, the most important is sialorrhoea, accompanied by swelling of the parotids and histological changes in the salivary glands. There have also been spasmodic conditions of the intestine, which have been observed in quite a number of cases, and some of these have been actually operated upon. Where this has been done, the intestine has been found to be contracted and pale in many regions. Lhermitte also notes a case which he observed in which the encephalitis began with abdominal symptoms which suggested appendicitis for which an operation was performed. This was followed by the appearance of typical eye symptoms and myoclonia.

¹ Archives of Neurology and Psychiatry, February, 1921, p. 150.

² Gazette des Hôpitaux, January 8, 1921, p. 37.

ENCEPHALITIS SIMULATING HYDROPHOBIA. Last year in *PROGRESSIVE MEDICINE*, I gave an extensive review on the subject of encephalitis and called attention to the fact that the appearance of this disease introduced an element of doubt into the diagnosis of almost every nervous condition. I noted at that time the large number of diseases which encephalitis can simulate, but failed to give one which Crookshank pointed out in 1918 when he called attention to the fact that the old physicians used to describe hydrophobia without the bite of a dog, and that this condition had been reported in England in 1918.

More recently, Denyer and Morley¹ have reported a case of encephalitis in which the diagnosis of hydrophobia might easily have been made had the observers not been familiar with the diagnostic features of encephalitis. The patient in question was a woman, aged twenty-five years, who had been well up to November 11, 1920. On that evening she did not feel well, and the next day she gave up her usual occupation. The following day she was sick, and appeared to be suffering from a mild attack of influenza. On the 14th, she was distinctly excited and anxious, and vomited in the morning and had headache. The following day she was maniacal, sitting up in bed and shouting that her mouth was paralyzed and that she was going to die. There was at this time weakness on the left side of the face. The following day she was wildly delirious, the most marked feature being dread of trying to swallow and the prolonged laryngeal spasm caused by the attempt to do so. The following day she became semi-comatose and in a severe spasm of the throat there was apparently a rupture of one of the constrictor muscles of the pharynx which caused subcutaneous emphysema. She regained consciousness on the 20th and the next day was considerably improved.

Her general condition, however, became worse, bronchopneumonia supervened and she died on the 24th.

EPIDEMIC ENCEPHALITIS WITH FACIAL PARALYSIS. Müller² has a short article in which he calls attention to the fact that the teaching regarding the so-called "rheumatic facial paralysis" will have to undergo revision. This term includes a number of different conditions. Sometimes the lesion is in the ear and is overlooked. They also included neuritis occurring in the course of so-called rheumatism, and the cases, of course, are reported after exposure to cold but these are certainly of great rarity. A careful study will show that most of such cases have another origin. A large number of cases are due to poliomyelitis, and if the trouble is limited to the facial nerve and occurs apart from an epidemic, the diagnosis will seldom be made. To these must be added cases of epidemic encephalitis. The diagnosis between a poliomyelitis and an epidemic encephalitis may be extraordinarily difficult. In typical cases of either disease, the danger of mistaking one for the other is slight, but where there is limited involvement, the diagnosis may be impossible.

Müller gives as an example the case of a woman, aged twenty-seven years, previously in good health, with no evidence of syphilis, who was taken with headache, particularly in the forehead above the eyes, loss of

¹ *British Medical Journal*, February 5, 1921, p. 191.

² *Deutsch. med. Wchenschr.*, September 22, 1921, p. 1119.

appetite, a tired feeling and ringing in the ears. There developed a left-sided facial paralysis. At the same time there developed a slight weakness of the sixth nerve, some pupil disturbance and some sensitiveness on pressure over the trigeminal point. The left-sided facial paralysis passed off quickly but after a short period of time there was a development of a slight paralysis of the right side of the face. This is another example of the manifold disturbances caused by epidemic encephalitis.

THE SIMULATION OF EPIDEMIC ENCEPHALITIS BY DRUG POISONING. Wilson¹ reports 2 cases of drug poisoning in which the diagnosis of epidemic encephalitis was made tentatively. The first was in a married woman, aged forty-two years, who had persistent postoperative insomnia following an appendicitis operation. She was given 5 grains of luminal every night for six nights without any results until after the fifth dose had been taken. On the afternoon of the sixth day, and before she had had the last dose, she complained of headache and double vision. Her temperature at that time was 100° F. Following the last dose of luminal she remained in a stupor for six days. During this period she could be aroused only to fall again into a state of lethargy; she would stop talking in the midst of a conversation and had to be prodded to keep on chewing when she had a mouthful of food. She complained of extreme weakness, was unable to hold her head erect and scarcely able to raise her hand to her mouth. After six days she brightened up, but for two more weeks had a very severe asthenia. She eventually made a complete recovery.

The second case was a man, aged forty-three years, brought into the hospital in a semi-stuporous condition. He could be aroused but it was impossible to keep him awake long enough to get any history. The upper eyelids could not be raised; the pupils were dilated but reacted well to light. The neck was flaccid and a similar condition was presented in the muscles of the extremities. After three days of lethargy he made a rapid recovery, and stated that a few days before his admission to the hospital he had bought a half pint of whisky from a bootlegger and drank the entire amount for the relief of his cold and, as Wilson says, like one of Bret Harte's characters, "he curled up on the floor and subsequent proceedings interested him no more."

Farrell has reported 2 cases of intoxication due to the excessive use of luminal, and Ruggles² reported the case of a woman who took 3 grains of the drug every night for nine months because of persistent insomnia. She developed a marked incoördination of the arms and legs.

I have seen one instance of profound somnolence produced in a child who was given the drug for convulsions. The patient, who lived at a distance from the city, was examined at one of the clinics and given the drug while in the hospital. The mother returned to her home with a prescription and continued to give the drug daily for over three months, when the child became unconscious. It remained in this condition, with great muscular relaxation, for several weeks after the drug was discontinued. This child under two years of age is said to have had the remarkable dosage of between 2 and 3 grains daily during most of the three month period.

¹ New York Medical Journal, October, 1921, p. 467.

² Archives of Neurology and Psychiatry, August, 1921, p. 234.

DIAGNOSIS OF ENCEPHALITIS. As I remarked above, nothing has upset the matter of diagnosis of nervous conditions both in children and adults as much as the advent of encephalitis. This problem is very ably considered both by Neal, and by Happ and Mason. It must be borne in mind that epidemic encephalitis may simulate practically any disease of the nervous system and the diagnosis may rest not so much on the individual findings as on the general picture of the disease. The first consideration is to eliminate the various forms of *non-purulent encephalitis*, such as may follow any acute infectious disease such as measles, scarlet fever, whooping cough, or mumps. The history of the illness, the frequent convulsions, the absence of prolonged lethargy and paralysis of the ocular muscles, will be the same. In some instances the differential diagnosis is scarcely possible as in the infantile cerebral paralysis of Strumpell which some regard as the cerebral type of poliomyelitis and some do not. In this condition there is the sudden onset, with fever, vomiting, convulsions and spastic paralysis, usually a hemiplegia or diplegia or frequently paralysis of the eye muscles and later athetosis, epilepsy and feeble mindedness. Happ and Mason state that typical cases can be differentiated from epidemic encephalitis by the clinical course, the persistence of the paralysis and the sequelæ. Personally, I feel that in most instances the diagnosis would be extremely difficult, if not impossible.

Encephalitis from *lead poisoning*, occasionally seen in young children, usually due to the eating of paint, is characterized by the presence of frequent convulsions, and, in the cases which I have seen, there has always been the history of the child chewing the paint off of the furniture and wood work.

The commonest disease to be encountered in children which may be mistaken for epidemic encephalitis is *tuberculous meningitis*. The onset in both may be identical. In cases which can be followed and the spinal fluid examined repeatedly, the diagnosis is sooner or later quite clear. The onset is more liable to be abrupt in encephalitis and the duration of the disease shorter, death, if it occurs, taking place earlier than in the tuberculous disease, though not necessarily so. As the disease progresses, even if the tubercle bacilli are not made out in the spinal fluid, the diminution in the reduction of Fehling's solution may be looked for. Animal inoculation may also help. The temperature in encephalitis starts high and usually subsides rather quickly, whereas in tuberculous meningitis there is usually little fever at the onset but with a gradual rise. In poliomyelitis, when one is dealing with the classical forms of the disease, the diagnosis presents little difficulties, the sudden onset with high fever, the frequent remission of fever which starts again on the third or fourth day and the presence of the typical flaccid paralysis, usually make the diagnosis clear, inasmuch as encephalitis has a slower onset and there is usually lethargy and ocular disturbances.

Syphilis of the central nervous system may usually be determined by the Wassermann reaction and the colloidal-gold test although it must be borne in mind that some cases of encephalitis have shown a luetic curve. The onset in syphilitic disease is usually much slower and there are usually changes in the eye grounds.

Brain tumor usually does not present much difficulty unless there should be the history of fever which might easily occur in early life, due to other causes. The presence of choked disk, which is rare in encephalitis, helps in the diagnosis, as may also the roentgen-ray examination. Brain tumors are not very common in children and may present unusual difficulties in diagnosis.

Abscess of the brain may at times suggest encephalitis and this condition should always be suspected where there is any evidence of a focus of pus, such as a chronic ear disease or a sinusitis. The blood cultures may show the presence of the organism.

The delirium and stupor of the various *acute fevers*, such as typhoid or septicemia, may resemble encephalitis, but blood cultures and the other laboratory findings generally make the matter clear.

Uremia may also lead to a mistake in diagnosis but the present urinary changes should ordinarily to put one on the right track.

Another condition which may also be mistaken is *drug poisoning* from such drugs as veronal, and I have seen one instance which the prolonged use of luminal produced a picture which might easily have been mistaken for encephalitis had it not been for the history of the administration of the drug.

An article by Comby¹ gives a very good résumé of the literature on encephalitis in children and a very satisfactory consideration of the diagnosis of the disease. There is also a review of the subject signed by the initials J. C. in the journal just cited which may be consulted to advantage for some of the earlier references to acute encephalitis in children.

Schultze² gives a graphic description of a case of encephalitis showing the Parkinson's syndrome and he also gives a discussion of the anatomical lesions.

Another review which can be recommended to the general reader is one by Symonds.³ From his article I have taken the following table showing the difference between poliomyelitis and encephalitis.

	Heine-Medin Disease.	Encephalitis Lethargica.
Age incidence.	Much more common in children.	Any age.
Onset of general symptoms.	Acute and subacute	Usually insidious or subacute.
Temperature.	At highest before development of paralysis.	Often more marked after the development of paralysis.
Onset of paralysis.	Acute.	Insidious.
Distribution of lesions.	Predominant in spinal cord.	Predominant in mid-brain.
Course.	Brief duration.	Long duration: weeks or months.
Cerebrospinal fluid.	Increase of lymphocytes fairly constant in early stages; globulin increased.	Lymphocytosis inconstant and seldom exceeds 70 per cent emm. Very little increase in globulin.
Involuntary movements.	Not observed apart from fibrillation.	Movements of divers kinds, frequently present at some period.

¹ Archives de Médecine des Enfants, August, 1921, 24, 457.

² Berl. klin. Wehnschr., March 14, 1921, p. 245.

³ Quarterly Journal of Medicine, April, 1921, No. 55, 14, 283.

IMMUNOLOGICAL DISTINCTIONS OF ENCEPHALITIS AND POLIOMYELITIS. With the appearance of encephalitis, the question of its identity or relationship with poliomyelitis naturally came into a certain amount of prominence. Von Economo, who first reported Austrian cases, believed that poliomyelitis could be excluded. Draper, after making a study of the residual paralyses in some of the cases occurring in England in 1918, believed that many of these were true cases of poliomyelitis, while Crookshank,¹ believes that encephalitis, poliomyelitis and other epidemic paralytic and nervous diseases may simply be different manifestations of one disease. Clinically, it seemed that there are a number of striking differences. The seasonal prevalence is usually different, poliomyelitis being a summer and fall disease, encephalitis a winter and spring affection. The mode of onset is also very markedly different, poliomyelitis coming on suddenly, whereas encephalitis has a slow onset.

Amoss² has made some observations on the immunological differences between the two diseases. He states that encephalitis is an epidemic disease, the main manifestations of which relate to injury inflicted on the central nervous system and in particular the basal ganglia of the brain; while the same may be said of poliomyelitis, with the difference that it affects particularly the gray matter of the spinal cord and medulla oblongata. He also suggests that at the outset of the epidemic of encephalitis, the two diseases tend to prevail at distinct and different seasons of the year but more recently cases of encephalitis have arisen in the summer months. He believes, therefore, that the two diseases are perhaps less distinct by seasonal prevalence than has been supposed. He noted, however, in his observations that there was a distinct difference in communicability to monkeys. Poliomyelitis is readily transmitted through inoculation of the affected central nervous tissue of man to monkeys, while it may still be regarded as doubtful whether encephalitis of the epidemic type has been communicated to monkeys in this manner. The two diseases, according to Amoss, can be distinguished through the power of blood serum under certain circumstances to neutralize the virus of poliomyelitis. The blood serum of convalescent cases of this disease, whether in man or monkey, possesses this neutralizing power, while the blood serum of recently convalescent cases of epidemic encephalitis is devoid of it.

Amoss, therefore, concludes that for the present it is desirable to regard the two diseases as distinct affections.

THE RELATION BETWEEN ENCEPHALITIS AND INFLUENZA. Netter has considered this subject which has excited a certain amount of comment inasmuch as the epidemic of influenza and the diffusion of encephalitis over the entire globe coincided and also from the fact that in previous influenza epidemics, similar observations had been made. This has led to the view, rather widely held, that encephalitis is merely influenza affecting the general nervous system. The four principal arguments that have been set forth in favor of this view are as follows:

1. The year 1918 saw the appearance of influenza and of encephalitis.

¹ Boston Medical and Surgical Journal, 1920, **182**, 34.

² Journal of Experimental Medicine, February 1, 1921, p. 187.

The so-called nona of 1890, which has been identified as epidemic encephalitis, undoubtedly made its appearance at the end of the epidemic influenza of 1889 and 1890.

2. Encephalitis is a disease of the cold seasons which are favorable to the development of influenza.

3. The fact that influenza affects the entire system and all parts of it so that the participation of the central nervous system is common.

4. The characteristic symptoms of encephalitis are often preceded by a short period characterized by fever, malaise, vague pains, sore throat, bronchitis, and other manifestations ordinarily associated with influenza.

The arguments against the four statements just made are given by Netter as follows:

1. While encephalitis and influenza both made their appearance in 1918, their occurrence was not simultaneous. The first cases of encephalitis occurred in February, 1918, and were published in journals in March and April of the same year, while influenza was not mentioned at Paris until May. Also, encephalitis was epidemic at Vienna and on a part of the French front in 1917, that is to say a year before the appearance of influenza.

2. The predominance of both diseases in the cold season means nothing, inasmuch as you see the same in many other diseases, like cerebrospinal fever and pneumonia.

3. The usual manifestations of grippe on the nervous centers is not like encephalitis. The anatomical changes are more marked and the histological changes differ.

4. The presence of sore throat, bronchitis, fever and prostration are common at the beginning of any general infection, especially when the port of entry is the nasopharynx.

One striking contribution is that of Almasio.¹ The first cases of encephalitis noted were in Turin in the autumn of 1919. Subsequently there was a small epidemic which reached its height during the last ten days of January when there were some 40 cases reported and after that the epidemic sank rapidly until it could be said to be practically over by the end of March. During the same period there was an epidemic of influenza and the curve falls almost, though not exactly, the same as the curve of the incidence of the encephalitis cases, that is reaching its highest point in the latter part of January and being practically over by the middle of March. Without drawing any conclusions from this epidemic, it certainly is clear, as others have pointed out, that there is a close relationship between the occurrence of the two diseases, which has been observed too frequently and with too great regularity to be dismissed without further study.

STATISTICS IN ENCEPHALITIS. Those interested in statistics and the methods of higher mathematics as applied to mortality and morbidity figures with reference to a prognosis in epidemics and other features, such as seasonal distribution, sex, and so on, will find the article by Pearl²

¹ Il Policlinico Sezione Pratica, February 14, 1921, p. 222.

² Johns Hopkins Hospital Bulletin, July, 1921, p. 221.

of great interest. Personally, my knowledge of mathematics is so slight that I have never been able to get up any great degree of enthusiasm for this method of study which always seems to me to state in terms only intelligible to those of a mathematical frame of mind what might just as well be determined from a study of the facts in the case without so much to do. It may be that I am perfectly wrong, but somehow such studies always remind me of some of the apparatus used to teach physiology, much of which is far more difficult of comprehension than the processes that occur in the body themselves.

The *mortality from this disease* seems to vary greatly in different localities and in different epidemics. Happ and Mason, in a series of 81 cases, had 6 deaths, a mortality rate of 7.4 per cent, while, in England, McNalty and others have reported mortality as high as 50 per cent. In France, Netter, and others, place the rate at from 25 to 30 per cent which has been about the rate in my own experience. In Neal's series the mortality rate was 28 per cent. Relapses are rare, but Netter states that they are liable to be attended by a high mortality rate.

THE MEDICO-LEGAL ASPECTS OF EPIDEMIC ENCEPHALITIS. Chavigny and Gelma¹ call attention to the medico-legal importance of this disease, particularly the psychopathic prodromes, the amnesia and the mental confusion so frequently met with. If the patient committed a crime during this prodromal period and was arrested for it, and, while awaiting the trial, the mental confusion disappeared and the patient appeared normal, serious errors might easily occur.

They cite the case of a butcher, aged twenty-six years, who entered the medical clinic at the University of Strassburg on July 6, 1920. He had at that time a slight fever, photophobia, frontal headache, fulness of the neck, diplopia, irregularity of the pulse and vomiting. The spinal fluid showed a lymphocytosis and the blood a leukopenia but with a more or less normal differential count. After some days there was a progressive improvement and the symptoms had disappeared. There were at Strassburg at this time a number of cases of epidemic encephalitis, a number of which were in an exceedingly serious condition. The patient, during the ten days that he was in the hospital showed no daytime somnolence, no agitation, no hallucination, but he had a marked lacunar amnesia, almost complete, which corresponded to the period preceding his admission to the hospital.

On July 4, two days before he entered the hospital he was arrested for stealing a bicycle. The theft seemed to have been committed by a subject who was normal and lucid. The patient took the bicycle while it was not being watched and rode away on it rapidly, with a number of persons in pursuit. He was arrested and attempted to bribe the officer by an offer of one hundred francs. He was placed in prison and on the 5th of July he was nauseated, vomited, had fever, seemed confused and did not remember why he had been arrested, and the following day he was taken to the hospital. The authors were assigned to examine the mental condition of this patient and after a careful study came to the conclusion that he was totally unconscious of what he had done.

¹ Bulletin de l'Académie, de Médecine, July 26, 1921, p. 113.

Such cases require very careful study as any excuse is liable to be urged in criminal cases, but with proper control one should be reasonably certain of the extent to which encephalitis is responsible for the mental state at the time a crime is committed, if at all.

THE TREATMENT OF ENCEPHALITIS. Economo¹ in an article dealing with the sequelæ of epidemic encephalitis and the treatment of the disease itself, states that he has not seen any satisfactory results from the use of salvarsan, elektrargol and similar preparations. He believes, however, that he has seen some results following the use of large doses of urotropin given intravenously at three day intervals, using from four to five injections of from 4 to 8 grams each. He also has seen a favorable outcome after the use of Pregl's iodine solution, the composition of which he does not give, evidently an iodine solution suitable for intravenous injection. This is also given in large doses.

Indiscriminate use of intravenous injections is, in my opinion, to be deprecated. Not infrequently very severe reactions take place, and these rarely find their way into the medical literature, so that from the glowing accounts that one sees they are led to believe that such incidents are rare, when, as a matter of fact, they are not very uncommon.

Cheinisse² has a short article reviewing the subject and giving some of his own opinions. Some of the German writers are of the opinion that it is best to do practically nothing beyond placing the patient at rest, but Cheinisse agrees with Pic, the professor of therapeutics of the Faculty of Medicine at Lyon, that, as soon as the diagnosis is made, there should be a definite and precise line of treatment.

The methods of treatment used, however, have all been done more or less tentatively, and many of the suggestions made do not seem to have any reasonable basis, such as the injection of various *antiserums*, various ones of which have been tried out, and I commented last year on the work of Capizzano and the results which he obtained by the use of diphtheria antitoxin injected intraspinally. At that time I suggested that the procedure of Goodman in the treatment of chorea, namely, the injection of the autoserum intraspinally, might be of some use. Brill,³ as a matter of fact, used this method in the treatment of 5 cases, and 4 obtained a rapid improvement. There have been a couple of instances in which antitetanus serum has been injected both subcutaneously and intraspinally and cases in which there is unusual stiffness of the neck and back and in which the diagnosis of tetanus had been incorrectly made.

In 2 instances reported by Laubie, the results were extremely favorable. Various authors have suggested the use of the serum of convalescents as being the most rational procedure, among these such men as Sicard and Chalié, while Netter is against this use, and Levaditi and Harvier⁴ have shown that the serum of convalescents not only is not capable of destroying the virus but in the case of the serum of recent convalescents, in place of destroying it, it seemed to facilitate the

¹ Wiener Medizinische Wochenschrift, July 23, 1921, p. 1322.

² La Presse Médicale, February 19, 1921, p. 146.

³ Medical Record, June 26, 1920.

⁴ Annales de l'Institut Pasteur, December, 1920.

development of the organism and to favor the development of the disease in the animals under observation.

As to the use of *injections of turpentine* with a view of producing supuration, Netter has treated 83 cases in this manner and in 67 there developed abscesses which were opened. In these 67 patients there were 5 deaths, or a mortality 7.46 per cent, while in the 16 other cases in which the injection did not prevent an abscess, there were 15 deaths and the patients who survived had the disease in a very mild form. It has been suggested that where the first injection does not produce a satisfactory result in forty-eight hours, it should be followed by a second and even a third two days later, the amounts used from 1 to 2 cc. in an adult and $\frac{1}{4}$ to $\frac{1}{2}$ cc. in a child.

One wonders whether this is really a form of treatment or merely gives an index of the cases that are putting up an active fight against the disease, and future work on it will be awaited with a certain amount of interest.

EPIDEMIC HICCOUGH. At about the same time that epidemic encephalitis began to appear in the journals, scattered reports from various parts of the world recording the fact that small epidemics of hiccough were appearing coincident with the epidemic of encephalitis. There is a very considerable amount of discussion regarding the nature of this disease, some believing it to be simply a form of epidemic encephalitis, while others are of the opinion that it is a distinct disease occurring coincidentally. Earlier reports were made by Economo in Vienna, by Micheli at Florence, Cardarelli in Rome, and shortly after by Stahelin in Switzerland. After a few months the disease was reported in Paris and elsewhere.

One of the best accounts of the disease which has been described by many observers is given by Pontano and Trenti.¹ Curiously enough, almost all of the cases reported have been in men. The disease ordinarily comes on without prodrome, the patient in perfect health is usually taken suddenly after a meal with hiccough. The disease may attack people in any walk of life. It does not seem to be in any way connected with the food taken. The hiccough is of the ordinary type and varies greatly in intensity, sometimes it is so severe as to cause the individual to stop work. The rhythm varies in different individuals and at different times. In some there are two or three hiccoughs a minute, continuing day and night, and in some cases the space between the hiccough is two or three minutes, or there may be long periods in which the hiccough ceases only to return again. In some cases the hiccough ceases during eating, is lessened by lying down on the back and in some ceases during sleep. Some stop gradually, the interval between the hiccough coming with longer periods of cessation while in others there is a sudden cessation. As a rule, the individual has no fever, but cases have been reported in which there was slight elevation of temperature. The duration of the disease is usually brief, the average being three or four days, the shortest being one-half a day and the longest reported case eleven

¹ Il Policlinico Sezione Pratica, August 29, 1921, p. 1163.

days. The general examination of the patient does not show anything, and after the disease leaves the patient may be either in perfect health or be left in a condition of asthenia. There is almost always a little redness of the pharynx and sometimes slight edema of the arch of the palate and the uvula. Some patients complain of a dryness or a burning of the throat. In the cases of Pontano and Trenti in which the spinal fluid was examined, it was found to be under normal pressure and showed nothing abnormal either clinically or microscopically. The diagnosis is made on the appearance of the persistent hiccough, with no other apparent cause. The prognosis, as a general rule, is good, but Micheli gives an account of 2 cases which were followed a short time after with myoclonia and the classical symptoms of poliomyelitis. In rare instances there may be fulminating cases, in which death takes place in one or two days.

Logre and Heuyer¹ report cases in which the patients suffered with symptoms of grippe a greater or less length of time. Lafosse reports cases in which there was a slight ocular and nasal catarrh and some intestinal disturbance. Sicard² describes 3 cases in which there were serious nervous complications. In one patient, aged forty years, there was a hemiplegia coming on three weeks after the hiccough; in another, fifty years of age, hemiplegia coming on the third day; and the third, aged sixty-five years, a hemiplegia followed by encephalitis with some myoclonia. The reverse has been noted, that paralysis took place first and the hiccough came on later, although in some of these instances the hiccough may have been due to nervous lesions quite apart from encephalitis, or if one prefers epidemic hiccough. At any event, they have found their way into the literature at the same time as the other reports.

Pontano and Trenti studied 4 cases and tried to reproduce the disease by using whole blood, blood filtered through a Berkefeld N filter, and by using water which had been used as a gargle and subsequently passed through the Berkefeld filter. This water produced a marked pain and some transitory redness at the site of the injection. All of 12 subjects inoculated were under observation for a period of a month but none of them developed hiccough.

There has been, as I said before, a large amount of discussion as to whether this was a form of encephalitis or not. As far as I can see, most of this discussion is idle talk. It will be necessary to await some definite information regarding the etiology and transmission of the disease before any definite opinion can be arrived at. My own view is that it is merely a form of epidemic encephalitis but this has absolutely no value as it is personal opinion without any very firm foundation on which to base it. So much of the discussion in the medical journals reminds one of the old theological disquisitions on how many angels or devils could dance on the point of a needle and most of them are based on nothing more than the author's fancy. Practically all of the authors make no therapeutic suggestions, but state that the disease is not modified by treatment. From a limited experience I have never failed to see the hiccough relieved with great promptness by the administration of a large dose of benzyl benzoate.

¹ Gazette des Hôp., 1920, No. 106, p. 1700.

² Bulletin Mem. Soc. des Hôpitaux, 1920, p. 1464.

HICCUGH FOLLOWED BY ENCEPHALITIS. As just stated there have been reported from time to time in the past few years a number of small epidemics of hiccough and there have also been a large number of sporadic cases, often of unusual severity, lasting for very long periods of time. These, I think, have generally been regarded as a manifestation of encephalitis and a report of Rivet and Lipschitz¹ is further evidence of the correctness of this view. Their patient was a man, aged forty-two years, who was taken with hiccough on December 4, 1920. He had a very slight elevation of temperature and a very slight jaundice. The hiccough was stopped by compression on the eyeball but returned two hours later when it yielded again to the same treatment for four hours. The next day the hiccough had disappeared entirely, but there was still slight temperature. On December 6th the patient was free from fever, the yellowish tinge rapidly disappeared and the patient seemed cured. The following day, however, the patient complained of headache, pain in the cervical region, in the arms and also about the ankles. This kept up until December 18th when the patient returned to work and kept at it until the 27th. At this time he complained of a desire to sleep, a general lassitude and a little headache. Following this he went into a typical mild attack of encephalitis of the lethargic type and at the time of the report his condition was stationary.

Sicard at the same time reported several instances of hiccough, one of which developed encephalitis with some myoclonia. In this patient there was also left hemiplegia.

Very similar to these reports is one by Rathery and Bordet.² They reported an instance in which a man, aged twenty-five years, first developed hiccough which lasted for some five days, three weeks later a myoclonia which lasted about twenty-four hours and which was followed by typical encephalitis of the lethargic type, during which the muscular contractions were present part of the time.

In some instances there have been attacks of yawning or unmotivated laughter. Instances of this kind have been reported by Sicard and Paraf.³ Their patient was a young man, aged eighteen years, who had a typical attack of encephalitis with the usual somnolence and eye symptoms. The lethargy lasted two weeks and persisted afterward in short sleepy spells occurring during the day. During convalescence there appeared a curious symptom which was described as follows: Suddenly, without any reason, the patient was taken with foolish laughter which he was unable to stop. This was accompanied with movements of the arms and legs and a tendency toward fainting. The attack of laughter was transitory, lasting only two or three minutes at the most, and then there would be a spasm of the muscles to the extremities and the patient returned to normal. The first day there were four or five of these attacks in the first twenty-four hours, but later on they were reduced to one or two a day.

In addition to these manifestations, there have been attacks described in other patients in which there was sighing with a sobbing character,

¹ Bulletins et Mémoires de la Société Médicale des Hôpitaux, January 20, 1921, p. 8.

² Ibid., February 11, 1921, p. 128.

³ Ibid., February 18, 1921, p. 232.

and also sighing alone. In other cases there have been automatic movements of the arms, the arms being raised and the head thrown backward.

EXPERIMENTAL HICCOUGH. The subject of epidemic hiccough is one that has always attracted some attention and has recently been brought to the fore through an increase of its occurrence in connection or simultaneously with the epidemic of encephalitis. Whether the epidemics of hiccoughs are due to the same organisms as those causing encephalitis is not known.

Rosenow,¹ at the Mayo Foundation, has studied 3 patients with prolonged uncontrollable hiccough. The patients were well otherwise and all recovered. From apparently normal tonsils, pus was expressed and a suspension of this made in salt solution. Washings were also made from the nasopharynx and suspensions of pus from pyorrhea pockets. Salt solution suspensions of cultures of the organisms grown from these specimens were injected intracerebrally into rabbits and monkeys. After from one to seven days, depending on the size of the dose and the virulence of the strain, the animals developed rhythmic, clonic spasms of the diaphragm. These spasms varied greatly in severity and duration. In some animals they occurred only for short periods and recovery was the rule. In others, the hiccough was more or less continuous, often to the point of complete exhaustion. These spasms could be controlled temporarily by either heroin, or morphine, and for short intervals by uniform, quite firm pressure around the abdomen at the level of the diaphragm. In addition to the animals named, ducks and rabbits were also found to be subject to the disorder. The spasms were caused also by injecting cultures intravenously in the trachea and also by packing the nose with gauze soaked in the cultures. Control observations with material from similar sources were negative. The changes found in the animals that died were slight. There were slight edema and cloudiness of the meninges, also some at the base of the brain and occasionally small hemorrhages were encountered. The microscopical findings consisted of circumscribed areas of hemorrhage, necrosis, polynuclear and round-cell infiltration usually surrounding the bloodvessels. The lesions were most marked in the basal ganglion and the walls of the ventricles and in the gray matter of the cortex and medulla. In acute lesions bacteria could be easily demonstrated, but in the more chronic lesions they could be found only after prolonged search. The organism isolated from the animals was a Gram-positive, non-encapsulated diplococcus, which produced small, non-adherent greenish colonies on blood-agar plates, and short chains in liquid mediums. These organisms resembled closely those which Rosenow has isolated in encephalitis and it was noted that after several animal passages, fewer animals developed hiccoughs and larger proportions developed lethargic and other symptoms of encephalitis.

A Case of Filaria Loa Infection. There are on record some nine or ten instances of persons infected with *Filaria loa*. These are mostly missionaries who have been on the west coast of tropical Africa. Begle² has

¹ Journal of the American Medical Association, June 18, 1921, p. 1745.

² Ibid., May 7, p. 1301.

added another case. This organism was first described by Cobbold, and is a colorless to a yellowish-white worm 16 to 57 mm. long by 0.3 to 0.7 mm. in diameter. The larvæ were described by Manson under the name of *Filaria diurna* which circulates in the blood in day time and is not to be distinguished from *Filaria bancrofti*. The organism is apparently very long-lived, and has been seen in persons who have been away from the infectious locality for as long as from ten to eleven years. The adult worm lives in the connective tissue, moving about from place to place and having a predilection for the tissues about the eye. This parasite has been associated with what are called calaber swellings. They come rather suddenly, attain a size of from 40 to 60 mm. in diameter, wander slowly and then disappear to reappear after an interval of months or years. When the parasite can be located superficially, it should be removed by a trifling operation.

Begle's case, which is reported from Detroit, was in a purchasing agent, aged thirty-two years. The patient had spent three years in Nigeria and while in Africa had numerous attacks of fever and at one time a swelling of the left hand. Since leaving Africa he lost in weight, suffered greatly from severe colds, with distressing coughing, with fever and night sweats. His blood was found to contain *Filaria* in the morning. In March, 1918, he thought that he had gotten a foreign body in the eye, but on examination found a fold of conjunctiva in which he saw something moving. This was a parasite which was removed and at the time of the report, three years later, there had been no further adult worms noted but there had been persistence of the embryos in the blood. The patient's general health has been greatly improved since the removal of the parasite.

Antimony in the Treatment of Filariasis. Low and O'Driscoll¹ have made a second report on this subject giving the results in 2 cases, 1 of which was studied in very considerable detail, when both the results were negative, which correspond to what they reported in a previous study.

Treatment of Furunculosis in Infants. The results from the treatment of furunculosis in infants, especially in those which occur in cases of malnutrition in institutions, are so unsatisfactory that any suggestions on this line are more than welcome.

Grulee and Rose² have made a short report which is worthy of attention. The usual method of treatment has been to open the furuncles before and after the skin is very thoroughly cleansed with 50 per cent alcohol, and after that, moist applications of 50 per cent alcohol are frequently applied, and in the severer cases baths of from 1 to 10,000 mercuric chloride are given. This method is only applicable where pure grain alcohol can be obtained, and so cannot be used under ordinary conditions as the mixtures of alcohol allowed under the Volstead Act are all likely to act as irritants to the skin, particularly of badly nourished infants. I have seen a dermatitis of very considerable severity set up by each of the different formulas used.

¹ Lancet, January 29, 1921, p. 221.

² Journal of the American Medical Association, July 2, 1921, p. 37.

Grulee and Rose state that they have not been able to obtain any results from the vaccine treatment or the use of yeast.

Having in mind the fact that the *roentgen-ray treatment in carbuncles* and localized infections was helpful and also that the same treatment was useful in acne, the observers were led to use the roentgen-ray in cases of furuncles in babies. They report the results in 8 cases and state that they have used the method in a number of others with satisfactory results, when the furuncles are in the early stage of development and not very deep. When the process is very superficial and over an extended area, the results were particularly satisfactory. The dosage, which was settled upon after some experimenting, was use a soft ray and no filter, a dose being 3 ma., 6 inch spark gap, and 9 inch focal distance for one minute. The use of the hard filtered ray was abandoned because it produced desquamation.

Glandular Fever. In 1889, Pfeiffer described, in the *Jahrbuch für Kinderheilkunde*, a disease which had been noted by certain Russian physicians, namely Filatow, Rauchfuss, and Korsakoff. Pfeiffer's article, however, brought the subject before the medical profession. Since then the disease has received a certain amount of attention, but very little has been added to our knowledge of it. Epidemics occur from time to time, one of the largest reported being that observed by Park West.¹ Anyone wishing to make a study of the literature on the subject will find excellent articles by Korsakoff² and in the thèse of Gourichon.³ As far as I know, none of the organisms isolated from the glands can be regarded as the cause of the disease, so that further work will have to be done before the etiology is cleared up.

The epidemics are usually small and occur at rather long intervals in any particular place although not necessarily so. The disease is a striking one, with its sudden onset, fever, headache, and the usual malaise. Occasionally, there are slight prodromes. There is frequently reddening of the pharynx and tonsils, and sometimes nausea, vomiting, and diarrhea. From twenty-four to forty-eight hours after the onset, various lymph nodes swell, most commonly those in the neck. The glands may become enormously large and may be limited to one side, although bilateral inflammation is the rule. The fever usually leaves suddenly. Sometimes the nodes suppurate but not as a rule.

The *differential diagnosis* is usually easy because tuberculous lymph nodes develop more slowly and individual swelling of the lymph nodes due to local lesions in the mouth or throat can usually be told by careful examination. The most important feature in diagnosis is the blood count, the leukocytes being increased from 17,000 to 20,000 and the differential counts show that the increase is due to the lymphocyte, which runs between 75 and 85 per cent. Many of the cells are of the Riedel or bilobed type. As the patient improves, the blood count returns to normal, usually after two or three weeks. The spleen, which is enlarged in about 60 per cent of the cases, usually has returned to

¹ Archives of Pediatrics, 1896, **13**, 889.

² Archives für Kinderheilkunde, 1905, vol. **41** and **42**.

³ Thèse de Paris, 1895.

normal size at the end of two weeks. These cases might well be mistaken for acute lymphatic leukemia.

The disease received a considerable amount of attention during the past year, there being an extensive article by Tidy and Morley,¹ and the *British Medical Journal*, April 30, 1921, 649, called attention to the disease in an editorial entitled "Acute Benign Lymphoblastosis," the name suggested by Bloedorn and Houghton.² Sprunt and Evans³ described cases under the title of "Infectious Mononucleosis."

It seems a great pity that the simple, old-fashioned name of glandular fever cannot be retained. This pernicious habit of coining new names for old diseases renders the study of medicine twice as difficult as it would otherwise be and leads to an extraordinary amount of confusion, but is a form of display which, as long as the human animal finds it easier to invent new names than to add new facts to our knowledge, will be continued to be indulged in.

The article by Tidy and Morley referred to above, contains a fair list of references concerning the disease. Additional references will be found in the article by Schäffer;⁴ by Trautmann;⁵ by Williams;⁶ and by Korsakoff.⁷

Granuloma Inguinale. Various reports have been made on this subject recently and the disease, which was formerly not given any attention in this country, is beginning to take on a certain amount of importance. In 1905, Donovan reported an organism which has been supposed to be the cause of the disease. There is still some doubt concerning it. It is variously classified, some regarding it as a new species and others as a member of the Friedländer capsular group.

In 1913, Grindon reported 3 cases in the *Journal of Cutaneous Diseases*, but the organism was not described, and Driscoll last year reported 3 cases of erosive vulvitis from Richmond but in place of the Donovan organism he described a spirochete. Campbell⁸ reported 3 cases from Bellevue Hospital and included 2 others previously reported by Symmers⁹ In this case the organism described by Donovan was isolated.

Lynch¹⁰ has records of some 30 cases apparently of this disorder, in most of whom the bacteriological studies were not made. The disease is of a very exceedingly repulsive nature producing an ulcerated granuloma of a more or less serpiginous character. The site of the lesion is usually either the inguinal region or upon the genital organs of either sex and may occur alone or in connection with other diseases, such as syphilis.

The method of treatment which has given the best results is the use of 1 per cent solution of tartar emetic, in normal salt solution or distilled water. Lynch usually starts with 3 cc of the 1 per cent solution diluted to 10 cc with either sterile normal salt solution or distilled water, increas-

¹ British Medical Journal, March 26, 1921, p. 452.

² Archives of Internal Medicine, March 27, 1921, p. 315.

³ Bulletin Johns Hopkins Hospital, 1920, **31**, 410.

⁴ Jahresbericht für Kinderheilkunde, 1908, **69**, 526.

⁵ Ibid., 1904, **60**, 503.

⁶ The Lancet, 1897, **1**, 160.

⁷ Archives für Kinderheilkunde, 1905, **41**, 321.

⁸ Journal of the American Medical Association, March 5, 1921, p. 648.

⁹ Ibid., May 8, 1920, p. 1304.

¹⁰ Ibid., September 17, 1921, p. 925.

ing the dose 2 cc every third day until 12 cc of the undiluted 1 per cent solution is reached. Some nausea and vomiting may occur at this time and if it does the dose is reduced. The small granulomata may be excised, the larger ones need to be curetted or removed with the actual cautery. There are certain cases in which the curette and cautery cannot be used and these sometimes will heal under the persistent use of tartar emetic. When the disease is complicated with syphilis, the individual will have to receive special therapy for both diseases, regulated according to the condition of the diseases.

Influenza. THE NASOPHARYNGEAL SECRETIONS FROM INFLUENZA PATIENTS. Among the numerous reports on this subject is one by Olitsky and Gates.¹ These observers² had previously reported that they had seen in cultures, both from the lung tissue of affected rabbits and in the filtered nasopharyngeal washings from cases of influenza, tiny bodies, almost invisible, which decolorize by Gram's method and which stain generally with difficulty with nuclear dyes. Without going into the details of their observations, it may be stated that they have cultivated minute bodies of characteristic morphology which are strictly anaërobic, are filtrable, and withstand glycerolation for a period of months. These bodies have been observed in the nasal secretion from early cases of uncomplicated epidemic influenza and from the lung tissues of animals used for observation. The changes in the blood and in the lungs of rabbits and guinea-pigs injected with these bodies are similar to those produced by the filtered and unfiltered nasopharyngeal secretions from early cases of epidemic influenza.

These same authors³ have described methods by which they have detected an active substance in 5 patients in early stages of epidemic influenza during 1918 and 1919, and 2 patients in early stages of the disease during 1920. It is not detected in 12 cases of epidemic influenza in which the onset of obvious symptoms occurred more than thirty-six hours before washing of the nasopharynx was carried out, nor was it found in secretions of 14 individuals free from the syndrome of influenza either during the epidemic or in the interval between them. Using this substance, they were able to produce, clinically and pathologically, conditions in rabbits which affected the blood and pulmonary structures and which could be maintained and carried through at least fifteen successive animals. Because of this and of the dilution between passages, they are led to believe that they were dealing with the actual transmission of a multiplying agent rather than with a passive transference of an originally active substance. In some of the observations, secondary infections by ordinary bacteria were encountered.

Loewe and Zeman⁴ have also reported the isolation in pure culture of a minute filtered Gram-negative organism from the washings from the nasopharynx in early cases of uncomplicated influenza. They have produced typical changes in rabbits by intratracheal inoculation of these

¹ Journal of the American Medical Association, March 5, 1921, p. 640.

² Ibid., May 29, 1920, p. 1497.

³ Journal of Experimental Medicine, February 1, 1921, p. 125.

⁴ Journal of the American Medical Association, April 9, 1921, p. 986.

cultures, and similar manifestations were produced by the same method using a culture kept at incubator temperature for fourteen months. The infectious agent has been carried through several animal passages and the organism has been recovered in pure culture from the lungs of animals suffering from the disease produced experimentally. These results seem to be identical with those produced by Olitski and Gates.

Having in mind the results obtained by Foster in isolating a filtrable virus in common colds, and also the confirmation of this by Gibson, Bowman and Connor, Branham and Hall¹ have made a study of the subject of a filtrable virus in persons with colds or influenza and after a considerable amount of work have come to the conclusion that there is no evidence in support of the theory that the cause of either common colds or influenza is a filtrable virus, and they did not find any bodies in the cultures which could not be found also in those from normal persons, in controls in all simple mediums examined and on blank slides. While they recognize the negative results limited to the attempt at cultivation, and including no attempts to reproduce the disease in animals, they do not offer conclusive evidence that such a virus is not involved.

AN UNUSUAL PAIN SYNDROME IN INFLUENZA. Reilly² describes a type of pain which he observed in a number of cases which he describes as follows: "The patient suffers with a mild head cold for a few days or even longer, when he is suddenly taken with a severe pain on the right side, usually on a level with the insertion of the diaphragm; the paroxysms, in many cases, last about one-half hour, returning at intervals of two or three hours throughout the day. In others the pain is continuous from the start. In many instances, within thirty-six hours, the pain shifts to the left side at the same level, but is less severe; sometimes it entirely disappears from the first side affected. In others, the pain alternates after the second or third day, and the attacks become less frequent and less severe, disappearing entirely within a week. In some instances the pain level is as high as the distribution of the sixth dorsal nerve; in others, it corresponds with the distribution of the ninth dorsal nerve. Tenderness over this area is present in a small number of cases; disturbance of epicritic sensation is never noted."

He also calls attention to the fact that most of the patients were very tender on one side or the other at a point where the line of the tenth costal cartilage crossed the parasternal. The attack passed off too quickly for a diaphragmatic pleurisy which it suggested.

Various pain syndromes have been described by many authors in connection with influenza, but very often the differential diagnosis is extremely difficult. The syndrome described by Reilly might be mistaken for inflammation of the diaphragm, intercostal neuralgia, or pain arising from some of the numerous abdominal conditions.

THE LEUKOCYTIC PICTURE IN INFLUENZA. Bunting³ has reviewed some of the work on this subject and has given the results of a few studies of his own. In spite of the large amount of work which has been done

¹ Journal of Infectious Diseases, February, 1921, p. 143.

² Journal of the American Medical Association, May 28, 1921, p. 1493.

³ American Journal of the Medical Sciences, July, 1921, 162, 1.

on this subject, there does not seem to be any general accord, and, curiously enough, according to Bunting, only one paper, that of Adler,¹ of Zurich, in which the changes in the blood have been especially considered.

The statements in the text-books vary greatly. Cabot, in his book on the blood, stated, in 1898, that five-sixths of his cases had a normal leukocyte count. Emerson, in his work on clinical diagnosis, 1908, says that after an early low leukocyte count one-half of his cases showed over 10,000 cells, some even reaching 20,000. Simon, in his sixth edition, 1907, was of the opinion that in uncomplicated cases the leukocytes are commonly diminished and may be normal, and that with a count of 15,000 cells some complication is present. Webster, in his diagnostic methods, third edition 1913, states that the white cells are usually diminished but may be normal.

The work of Adler was an attempt to construct the leukocytic picture of the disease by a daily total and differential counts. He found an increase in polynuclear leukocytes during the prodromal stage and on the first day of the fever. This was followed by a leukopenia, with reduction of neutrophiles, eosinophiles and basophiles, which is due to marrow inhibition. There is then a positive marrow reaction, so that until the fourth or sixth day the blood picture approaches normal. There is an early absolute reduction in the number of lymphocytes followed by a reactive lymphocytosis. He insists that a disease with a constant leukocytosis cannot be influenza. He draws another conclusion which, as Bunting says, is possibly not entirely justified, that diseases which result in immunity show in their course a leukopenia, diseases without an immunity a leukocytosis. The two striking exceptions, scarlet fever and smallpox, he explains in the presence or the effect of the secondary streptococcic invader.

In the reports of the journals in the epidemic of 1918, chiefly those made in army camps, Bunting gives a brief review, the summary of which is that in influenza there is an early inhibition, not exhaustion, of the marrow activity by the infecting agent, resulting in a leukopenia which is characteristic of the disease. The marrow remains capable of stimulation by pyogenic infections which may occur as complications and a moderate degree of leukocytosis may result.

The study made by Bunting is particularly in accord with the findings of Adler, and he also adds the diminution of the blood platelets. The study of blood, particularly with reference to the number and character of the white cells is a subject which is deserving of more attention than it receives and very many instances find that the counts made are taken to count only the number of white cells, which as a matter of fact tell very little. In spite of the amount of work done on the blood, there still remains much to do.

AN EPIDEMIOLOGICAL STUDY OF INFLUENZA IN AN ISOLATED RURAL COMMUNITY. Armstrong and Hopkins² made a careful study of the disease as it occurred on Kelley's Island, Ohio. The epidemic occurred in

¹ *Folia Hematologica*, November, 1919, **25**, 16.

² *Public Health Reports*, July 22, 1921, p. 1671.

January and February, 1920, and there were 689 persons on the island, all of whom were white. The epidemic seems to have begun promptly on January 24, and reached its peak on January 31, and then to have fallen until February 16, when new cases practically ceased to appear. The epidemic was studied in considerable detail and certain important conclusions have been drawn. The first point of interest was that the observers thought that the public schools remained in session without medical supervision of any kind during the portion of the 1920 epidemic which served as a center of the spread of the disease on the island, but they hastened to add that they did not mean to infer that prompt closure of this school would have prevented the epidemic, but they believe that it probably would have delayed it. The question of school and influenza epidemics is a very important one, and health officers in communities frequently like to do theatrical things with a view of preventing the spread of influenza epidemics, and closing the schools and churches is one of these. As far as I know, there is no evidence that this closing of places where people congregate does anything more than to delay the epidemic.

The incubation period most frequently observed appears to have been from one to four days, but they noted that a relative immunity seemed to be apparent fifteen months following the 1918 epidemic. Milk and water had no apparent relation to the spread of the disease in the epidemic of 1920.

EFFECT OF VACCINATION AGAINST INFLUENZA. Judging from the various reports which have been made, the efforts made to limit the spread of influenza by the use of vaccines containing the influenza bacillus and other organisms commonly found in the upper air passages have not been unsuccessful. As an illustration, I can cite the observations of Jordan and Sharp.¹ They made a study of approximately 6000 persons who were under observation from November, 1919 to June 1, 1920. About one-half of these were vaccinated with a bacterial suspension containing the Pfeiffer bacilli, streptococci, and pneumococci. The other half of the number were not vaccinated. They all lived approximately under the same conditions. Some of these were attacked by influenza in the 1920 wave, which occurred within two months of the vaccination. In addition, the usual number of pneumonia and common cold cases, among those observed, afford material for comparisons.

Rhinitis and bronchitis developed with frequency about equal in vaccinated and unvaccinated groups.

The influenza attacks among the 2873 vaccinated numbered 118 (4.1 per cent) and among the 3193 unvaccinated numbered 152 (4.8 per cent); 7 pneumonia complications, with 2 deaths, occurred among the 118 vaccinated patients; and 12, with 2 deaths, in the 512 unvaccinated. Both the influenza and pneumonia attack rates are hence somewhat lower among the vaccinated, but the difference is not great. Pneumonia, not associated with influenza, was also less frequent among the vaccinated, only 6 of 19 pneumonia patients having been vaccinated. The small numbers hardly warrant, although they suggest, a favorable con-

¹ Journal of Infectious Diseases, April, 1921, p. 357.

clusion regarding some slight prophylactic value for pneumonia. That any considerable degree of protection against influenza was conferred by the vaccine seems unlikely.

TREATMENT OF INFLUENZA. Neilson¹ has contributed an article dealing with the treatment of influenza based on his experience at the Naval Station at Mare Island, California. The directions issued for the treatment of patients have to do with the use of sodium salicylate and magnesium sulphate given intravenously. The following is the outline of the treatment with which the best results were obtained:

- (a) Absolute rest in bed.
- (b) Thorough and constant alkalinization either by mouth or soda bicarbonate per rectum by Murphy drip.
- (c) Sodium salicylate intravenously only in cases not complicated by pneumonia, and then only when pain, restlessness, and high temperature evidenced severe toxemia.
- (d) Magnesium sulphate intravenously in pneumonia cases showing bad general condition, high temperature, and falling white count.
- (e) Blood transfusion (citrate method with whole blood) in pneumonia cases showing cyanosis, rise in temperature (either when first seen or after failure to react permanently to magnesium sulphate intravenously) and a falling white count.
- (f) Stimulation used more sparingly and only when indicated for special purpose or in selected case. Whisky, digitalin, or camphor used as stimulant.
- (g) Sodium iodide in simple cough mixture to relieve troublesome dry cough.
- (h) Magnesium sulphate by mouth for catharsis.
- (i) Carbohydrate diet.

The directions for the treatment of cases by pneumonia is as follows:

1. Give intravenous injection of sodium salicylate 5 gm. in 10 cc of distilled water. If any toxic symptoms of an alarming nature appear, give 250 cc of 4 per cent soda bicarbonate solution intravenously. The salicylate mixture should be prepared fresh each day: 50 grams of salicylate of soda placed in flasks and brought up to 100 cc with fresh distilled water and boiled makes it ready for use.

2. Cases should be controlled by urinary examinations and blood counts before and after treatment. The urinary examination should consist of determining the acidity of urine with methyl-red paper. Examination for albumin and casts should also be made. To determine if there is an upset in the carbohydrate metabolism also examine for acetic and diacetic acid. Complete blood count should be made before the intravenous use of the salicylate and six hours after.

3. The urine should be kept alkaline to methyl red. This can be done by giving the patient a teaspoonful of the following mixture every three hours. Give it until the urine becomes alkaline and keep it so:

Sodii bicarbonatis	100
Magnesii oxidi ponderosae (heavy calcined)	25
Calcii carbonas precipitatis	25

¹ U. S. Naval Medical Bulletin, April, 1921, p. 259.

4. Patient should have at least 500 grams of carbohydrates daily. This may be divided between milk, cereals, the various sugars, ice cream and alcohol if necessary. Eggnogs to be made with sugar, canned milk, and enough alcohol to disguise flavor.

5. Control cough with codeine and heroin. Control restlessness by liberal use of opiates.

The directions for the treatment of influenza and pneumonia are outlined by Neilson as follows:

Keep patients in bed under observation for twelve hours unless they are extremely sick and have high temperature when you first see them. If temperature does not drop in twelve hours, give sodium salicylate, 5 grams, intravenously. In the majority of cases, temperature keeps up for more than forty-eight hours and is ragged in character. Use a 2 per cent magnesium sulphate solution with 0.2 per cent calcium chloride in it.

Preparation of Solutions. Sodium salicylate, 5 grams; distilled water, sufficient to make 10 cc; sodii bicarbonate, 0.4 gram in 10 cc of distilled water.

Bring each solution to a boil separately. Use a 20 cc Luer syringe. Suck up the 10 cc of salicylate mixture and then the 10 cc of bicarbonate mixture. Give in a vein at the bend of elbow as you would concentrated salvarsan. Use either a 10 or 21 gauge needle.

Preparation of Magnesium Mixture. Take two 500 cc flasks, place 250 cc of distilled water in each flask. Add 10 grams of magnesium sulphate, preferably Squibb's, to one flask; in the other dissolve 1 gram of calcium chloride. Boil separately and filter into another 500 cc flask. Stop with cotton and boil this for five minutes and it is ready for use. Give the above at body temperature, but do not bother to regulate the temperature of the solution. From 300 to 400 cc of this mixture can be given at one dose. Give in salvarsan outfit with 19 or 21 gauge needle, taking one-half hour for the injection. Vomiting is liable to take place during this. Watch respiration and if it becomes shallow stop your solution.

Laboratory Work. Check cases by determining urinary acidity and amount of chlorides. Get blood counts in all cases. If blood count is low and the patient's general condition poor, magnesium sulphate should be used at once. Do not use stimulation until clearly demanded. Do not use aspirin and other drugs by mouth. A little whisky can be given if stimulation is necessary.

Neilson believes that the use of sodium salicylate intravenously relieves the pain and restlessness and places the patient in a better position to withstand the disease, but that it should not be used if there is evidence of beginning pneumonia. The magnesium sulphate given intravenously gave the most marked improvement in the general condition and relieved edema of the lung and brain best when administered at the start of the pneumonia and edema. When used late, when the patient was deeply cyanosed and unconscious, its favorable action was transient. The advantage in the magnesium sulphate treatment lies in the readiness of materials, the simplicity of equipment and the

fact that the solution can be prepared in advance and kept for long periods. Blood transfusion gave good results, especially in pneumonia cases with marked cyanosis, but the objection to this method of treatment is the difficulty of obtaining immune donors and the protective tests necessary, and the elaborate equipment required.

Neilson believes that white blood counts are essential guides to proper treatment and states that in general a stationary white count, either high or low, is favorable. A falling white count is a danger sign. A falling white count with a rising temperature shows a seriously ill patient, and if cyanosis is added, a critically ill patient.

Epidemic Jaundice. This disease, usually known as Weil's disease, has taken on new interest, so that the publication of a study, by Ryle,¹ made sometime ago, is most welcome. Preliminary reports of this work were made earlier. The account is based on a small epidemic which occurred during the summer and autumn of 1916 among the British troops occupying the Ypres sector of the Western Front. The total number of cases probably did not exceed 200, 100 of which were studied, and 50 of which were under the personal care of the author.

Weil noted that the disease occurred in localized groups and epidemics, and found it common among butchers. Subsequent writers also note the fact that workers in sewers, slaughter houses and wet ditches, that is, places where rats were liable to be, were most frequently subject to the disease. The epidemics may be limited to a house where 3 or 4 cases occur, or to a number of persons in some institution, or the disease may be widespread in a community. In Japan, and some other places, the disease seems to be endemic, and epidemics have been reported from many quarters of the globe. Inada, and his colleagues, found that in mines where the disease occurred, those in dry shafts were not affected, while those in wet shafts had the disease. Stokes found that there was a seasonal variation, cases decreasing during dry weather, and increasing after a wet spell, and by plotting the cases out on maps found the infected area in the epidemic studied by Ryle to be localized to two particular sectors of trench which were wet and ill-drained, even in fair weather. The men who occupied the water-logged posts and more frequently those who were there for a longer period of time developed the disease there or shortly after leaving. There was only one instance of an officer being infected.

Most of the cases occurred between April and October, but the disease did not entirely disappear during the winter months. Uhlenhuth² has shown that freezing will not kill the spirochete. In 1916, the Japanese observers, whose observations I have detailed in former numbers of *PROGRESSIVE MEDICINE*, isolated the spirochete in the kidneys and urine of 38 per cent of ordinary field rats. Stokes confirmed this, and also showed that guinea-pigs infected by the rat spirochete could be cured by the serum of convalescent human patients. From these and other observations, one can state with comparative safety that the rat is the carrier of the disease.

¹ Quarterly Journal of Medicine, January, 1921, No. 54, 14, 139.

² Deutsch. med. Wchnschr., 1918, 44, 1320.

It is difficult to determine the incubation period, but it is usually placed between five to twelve days. In an accidental laboratory infection recorded by Martin and Pettit,¹ the incubation period was shown definitely to be between six and eight days.

The onset is more frequently sudden than gradual. It sometimes appears with vomiting, pain in the limbs and giddiness; in others, there is headache. The temperature makes a rapid rise from the first day and reaches the maximum on the second, third, or fourth day of the illness or occasionally later, then there is an irregular descent usually with big remissions. The temperature lasts about ten days on an average and is followed by from one to six days of subnormal temperature. There is a distinct tendency to relapse with the recurrence of fever. The shortest initial pyrexia is given as six days and the longest as sixteen. The tongue is excessively dry and coated, although sometimes it has a glazed appearance. It is usually brown and frequently fissured. The saliva seems to be deficient in amount and sordes collect on the lips and teeth. Vomiting is perhaps the most constant symptom, occurring in over three-quarters of the cases, and sometimes, if prolonged, may be accompanied with vomiting of blood and, in very grave or fatal cases, hiccough may be developed. In a small number of cases there is marked abdominal pain.

The heart usually remains in good shape despite the severity of the disease, and in the patients who recovered there did not seem to be any permanent damage to the heart-muscle. Bradycardia is frequently present in the early stages but is usually of short duration. There is nose bleed, occasional hemoptysis and sometimes cough and increased respiration. Albuminuria occurred in more than one-half of the cases and hematuria occasionally. There are numerous nervous symptoms including general muscular weakness, giddiness, very marked prostration and what is described as an intense physical and mental misery due to the generalized pain and hyperesthesia. This makes the patient keep very quiet and avoid any unnecessary movements. The patients usually state they feel as if they had been beaten. Leg pains are present in nearly one-half the cases, and sometimes the patient is suspected of having a beginning meningitis. There is injection of the vessels of the conjunctivæ and with this was associated tenderness on pressure over the eyeballs. Occasionally there is photophobia. The text-books state that there is an injection of the spleen, but Ryle did not find this to be the case, and at all the postmortem examinations the spleen was found to be small. There was injection of the lymph nodes reported in some cases.

The jaundice makes its appearance between the third and sixth day of the fever, gradually increasing in intensity, reaching its maximum about the seventh or eighth day. The icterus is described as being yellow and never greenish or bronzed. Itching, presumably due to the jaundice, is occasionally noted. A large number of patients suffered with herpes labialis, which almost invariably became hemorrhagic.

The prognosis varies in different epidemics in different places. The

¹ Bulletin de l'Acad. de Méd., Paris, 1916, 76, 247.

Japanese report as high as 32 per cent mortality, whereas Ryle's epidemic showed only 5.4 per cent. Other reports from epidemics fall in between these two figures.

The *treatment* is largely symptomatic. Sodium bicarbonate is used to allay the vomiting and acidosis. Salvarsan, before it is used generally, needs further study. Protective serums have been used notably by Nicolle and Lebailly,¹ and by Inada² and his associates.

The *differential diagnosis* is important and at times exceedingly difficult, especially in the early stages and in the cases which do not have icterus. In Ryle's, it was found that patients were admitted with such varying diagnosis as influenza, P.U.O., that is pyrexia of uncertain origin, tuberculosis, pneumonia, paratyphoid, rheumatism, trench fever, and cerebrospinal fever. From the typhoid group, blood cultures and the cultures from the feces and urine, and agglutination tests, may settle the problem. Cerebrospinal fever should be eliminated by lumbar puncture. A high leukocyte count and the bacteriology of the sputum is a help in occluding pneumonia. Ryle believes that the diagnosis can usually be made on the clinical evidence alone, the chief difficulty being to tell the cases which do not show jaundice. The severe generalized pains with vomiting, albuminuria, the tendency to hemorrhages, to a less extent the injection of the conjunctivæ, the absence and injection of the spleen are of value. Ryle states that in the first few days of the fever, epidemic jaundice is a very definite disease, while in the first few days of typhoid or paratyphoid the disease is very indefinite. Vomiting and albuminuria are rare in the early typhoid infections and almost a rule in epidemic jaundice, or, as Ryle prefers to call it, *spirochaetosis*, which appellation always reminds me of Lowell's "Science peddling with the names of things."

As regards meningitis Ryle believes that a confusion would only occur either on insufficient acquaintance with one or both diseases or from a careless examination. The severity of the pain, headache, fever, herpes and vomiting may well suggest meningitis and the presence of Kernig's sign may even be claimed, but on closer inspection the general attitude and decubitus will be found to be very different. The patient may lie on his side more or less curled up in Weil's disease, and his stillness seems to be due to an unwillingness to move rather than a painful incapacity. He may resent being turned over or handled, but it does not give him the look of meningitis and the anxious expression of dread is absent from his face. The headache is a secondary symptom as a rule, while in a conscious case of meningitis it is invariably the first and worst. The Kernig's and neck rigidity will be found to be what Ryle calls a pseudo-Kernig and a pseudo-neck rigidity, that is to say the limitation of the leg does not convey to the observer a sense of spasm or of sudden stoppage as from an ankylosis or contracture, or rather is it a resistance which can as a rule be gradually overcome, and which is obviously dependent on muscular or fascial pain. The same applies to the neck rigidity. In meningitis the sensation is that of a steel bar inserted down

¹ Compt. rend. Soc. de Biol., Paris, 1918, **81**, 1143.

² Journal Experimental Medicine, 1916, **24**, 485.

the spinal canal; in Weil's disease continued gentle pressure overcomes the rigidity. If any doubt still exists, a lumbar puncture should be resorted to.

Some cases may very strongly suggest pneumonia. The rapid breathing, herpes, rusty hemoptysis, and a high fever are very suggestive. One cannot exclude pneumonia because there is no sign of consolidation. In Weil's disease the pain is hardly ever referred to the chest and is not stabbing, and particularly is not confined to one side of the chest. The breathing is not as difficult as in pneumonia.

According to Ryle, trench fever is by far the most difficult to differentiate. Between a severe trench fever and a Weil's disease, he states that it is well-nigh impossible to draw clear clinical distinctions. In trench disease the headache, backache, limb-pains, conjunctival injection and even a transient albuminuria may all be present, and the pyrexia may show a closely similar irregular growth except in the five day relapsing type. In trench fever, there is a definite tendency to localize in the shins, the left hypochondrium, or the head. The tongue is often quite clean, herpes is rare and hemorrhages with the exception of nose bleed, exceedingly rare if it occurs at all.

The differential diagnosis in the cases with jaundice is not as difficult as the high fever alone, especially in the absence of other febrile epidemics limits the field. The chief possibilities are typhoidal, paratyphoidal jaundice, and catarrhal jaundice. Jaundice occurring in the course of acute relapsing fever or with pneumonia might cause some confusion.

Leptothrix Angina. Fürbringer¹ has a short article on this study. Leptothrix infections of the throat are comparatively rare. The case which he reports occurred in a woman aged twenty year, who had previously suffered from a sore throat, with high fever, and had subsequently suffered from piano player's cramp, with muscle weakness; otherwise she appeared as a healthy person. For four weeks she had had a slight cold, with some coryza and rawness in the throat, with white flecks covering the tonsils. The physician whom she consulted feared diphtheria, but finally decided that the infection was of a different nature and it was cured by local application. A few days before she consulted Fürbringer there had been a return of the trouble, but without any general disturbance. She had a membrane on both tonsils extending to the hard and soft palate. These changes appeared as a white or yellowish-white, oval areas, very suggestive of diphtheria or the changes seen in the throat in scarlet fever, and a slight catarrhal inflammation of the pharynx. The breath was slightly fetid, there was no swelling of the cervical lymph nodes, and no fever. The examination of material taken from the throat showed an almost pure culture of the leptothrix buccalis, which is an almost constant saprophyte in the mouth where the teeth are not well cared for. The author is of the opinion that this was an instance in which the leptothrix buccalis took on a pathological character.

Inflammations due to the leptothrix have been described in considerable number. Deussing² described a case of throat infection with an

¹ Berl. klin. Wehnschr., May 2, 1921, p. 437.

² Deutsch. med. Wehnschr., 1920, p. 1278.

acute hemorrhagic nephritis, and von Arx reported an instance of the phlegmon caused by leptothrix in the case of which the infection started in a carious tooth. The article under consideration gives a brief résumé of the literature of the subject one of the best pieces of work being the article by Kraus,¹ to which little has been added in the past quarter of a century.

The infection is very resistant to treatment, the usual antiseptic solutions, nitrate of silver or iodine being most frequently employed; some use applications of chromic acid or trichloroacetic acid. The fact that it occurs in non-smokers, suggests the use of tobacco as a cure, but this is not always effective. Not infrequently after certain length of time has elapsed, the infection disappears spontaneously.

Tropical Bronchopulmonary Mycosis. The various organisms of the fungus type which are liable to cause diseases in the respiratory tract, particularly in the tropics has been studied by many observers among whom Castellani holds a very high rank.

Mendelson² has a short report on the subject in which he gives the latest classification of the mycotic respiratory diseases as follows:

GROUP 1. *Monilia* persoon, 1797; *Oidium* Link, 1809; *Saccharomyces* Meyen, 1833; *Willia* Hansen, 1904; *Cryptococcus* Gilchrist and Stoker, 1896; *Coccidioides* Rixford and Gilchrist, 1898.

GROUP 2. *Hemispora* Vuillemin, 1906.

GROUP 3. *Nocardia* Toni and Trevison, 1899; *Cohnistrepthothrix* Pinoy, 1911.

GROUP 4. *Aspergillus*, 1729; *Sterigmatocystis* Cramer, 1869; *Penicillium* Link, 1908; *Mucor* Micheli, 1729; *Rhizormucor* Lucet and Costantin, 1900; *Lichthiemia* Vuillemin, 1904.

GROUP 5. *Sporotrichum* Link, 1809.

In the city of Bangkok, the weekly deaths ascribed to tuberculosis averaged from 15 to 33 per cent of the total deaths reported. At one of the local hospitals where lung conditions were studied, it was found that 5 per cent of the lung diseases were due to mycosis, 23 per cent to spirochete infections, while the remainder were classed as tuberculosis, but only in 10 per cent could the tubercle bacillus be demonstrated.

Without going into his report further, this would seem to be an opportune time to emphasize the necessity of making careful studies of lung conditions in which the tubercle bacillus cannot be demonstrated. It is highly probable that, particularly in the south, there are a great number of lung infections believed to be tuberculosis which are due to other organisms.

Malaria. THE CONTROL OF MALARIA. In spite of many drawbacks, the control of malaria is becoming more and more effective, particularly in certain places. This is well exemplified in an article by Leathers.³ Taking, for example, the state of Mississippi, we find that in the period from 1915 to 1919, in the first few years of this period, there were over 150,000 cases in the state, and, in 1916, 160,000 cases, whereas in 1918

¹ Nothnagel's Pathologie und Therapie, vol. 16, Part 1, Abt. 1, 212.

² Journal of the American Medical Association, July 9, 1921, p. 110.

³ Southern Medical Journal, April, 1921, p. 269.

and 1919 the number dropped to slightly over 100,000. The number of deaths shows an even more striking decrease, there being 1492 deaths in 1915, and only 653 in 1919. Where the work to control the disease has been more or less intensive, the results are more striking. In the same period in Harrison County, Mississippi, during the first three years there were 1658, 1599 and 1499 cases respectively, whereas in 1918 the number dropped to 851 and in 1919 to 475. The deaths in 1915 were 12 and in 1919 they were only 2. The number of cases and the number of deaths is far too great, and it would seem that in a country which claims to be entirely civilized such a disease as malaria should be fought very much more aggressively than it is at the present time.

Where coöperative campaigns are carried on, the results are very striking, as is shown by an article by Le Prince.¹ The cost of the campaign is comparatively little when compared to the saving in disease and death.

THE STANDARD TREATMENT FOR MALARIA. In order to get an effective treatment for this disease, the last National Malaria Committee suggested a standard which they hoped would be generally adopted by practicing physicians wherever malaria prevails. Their suggestion was as follows:

"For the acute attack 10 grains of quinine sulphate by mouth three times a day for a period of at least three or four days, to be followed by 10 grains every night before retiring for a period of eight weeks. For infected persons not having acute symptoms at the time, only the eight weeks' treatment is required.

"The proportionate doses for children are: Under one year, $\frac{1}{2}$ grain; one year, 1 grain; two years, 2 grains; three and four years, 3 grains; five, six and seven years, 4 grains; eight, nine and ten years, 6 grains; eleven, twelve, thirteen and fourteen years, 8 grains; fifteen years and older, 10 grains."

The object of the treatment is twofold, one to cure the patient of his disease and the second to prevent relapse and transmission of the infection to others. These last two features have not had a proper amount of attention paid to them, as usually the physician was satisfied if he obtained a temporary respite from the disease and little attention was paid to the recurrence or the transmission except in certain instances.

The preference is the use of quinine sulphate which is the best known of the salts and which seems to be effective. There are three methods of administration, preferable intravenously, intramuscularly and oral. The intravenous method is not without a certain amount of risk and should not be used except in pernicious cases in which the patient is in immediate danger. The intramuscular injection is not to be used under ordinary conditions, and Bass² is of the opinion that it is not a practical method in dealing with large numbers of cases of malaria, the danger of abscess, from necrosis, deter most physicians from using it except in special cases. Bass goes into a considerable discussion as regards dosage, size and interval, and the proportion of doses for children. One wonders

¹ Southern Medical Journal, April, 1921, p. 297.

² Ibid., p. 280.

if it would not be better to establish a dosage based on the weight of the child rather than on the age.

This whole subject of malaria is of extraordinary practical importance. In the south, constant association with the disease has, in many places, bred the contempt that comes from familiarity. It is to be hoped that the efforts of the Public Health Service and the Rockefeller Foundation, and various other agencies that work in trying to cope with this plague will eventually be successful.

Measles. **STUDIES ON MEASLES.** It is very curious that a disease as common as measles and which is attended with so many grave consequences, has had so little attention paid to it by investigators in scientific medicine. As Sydenham said, "It does more to fill Charon's boat than smallpox does."

In view of the fact that the prevention of measles by quarantine is unsatisfactory, owing to the contagiousness during the prodromal period, studies have been made with a view of preventing the disease by protective inoculation.

Of the more recent observations of the transmission of measles is the work of Anderson and Goldberger, who, in 1911, reported that they had been able to transmit the disease to monkeys by the use of defibrinated blood, blood serum, and washed corpuscles from cases of measles in the preëruptive or early eruptive stages of the disease. The inoculations were made intravenously, subcutaneously, also into the peritoneum and into the brain. They also claim to have transmitted the disease by subcutaneous injections of ascites, broth, blood cultures from patients in the early eruptive stages of the disease. Subsequently, Nicolle and Conseil reported the transmission from man to monkey and from monkey to monkey.

Studies on the leukocyte count in monkeys inoculated with blood from measles patients have been made by Hektoen and Eggers, Tunnicliff, and Lucas and Prizer. They have shown that there is a diminution of the total white count but there was, as Blake and Trask state, little definite evidence that the monkeys were infected with measles.

On the negative side are the observations of Jurgelunas, who exposed 2 monkeys for five days to active cases of measles in a hospital ward and also inoculated monkeys with defibrinated blood and with the secretions of the respiratory tract from cases of measles, but without any results.

More recently, Sellards, and Wentworth and Sellards have made observations on 5 monkeys which were intensively inoculated with blood from preëruptive and early eruptive cases of measles and eight susceptible human beings, but with entirely negative results.

Blake and Trask¹ have apparently demonstrated that monkeys (*Macacus rhesus*) are susceptible to inoculation with the virus of measles. Several methods were used. The unfiltered nasopharyngeal washings from cases of measles in the preëruptive and the early eruptive stages of the disease were injected into the trachea of the monkeys and this

¹ Journal of Experimental Medicine, March, 1921, p. 385.

procedure was followed by a relatively constant group of symptoms closely resembling those of measles in man. Of 7 monkeys so inoculated, 5 developed symptoms. The same group of symptoms was induced in 1 monkey by inoculation of the mucous membrane of the nose and mouth with unfiltered nasopharyngeal washings from a case of measles. In these experiments a variety of organisms were present in the material included, but they were doubtless in no way responsible for the reaction, since the same group of symptoms was induced in 2 monkeys by the intratracheal injection of nasopharyngeal washings in 3 cases after the washings had been freed from ordinary organisms by filtration through Berkefeld N filters. This same characteristic group of symptoms has been successfully carried through six passages by intratracheal injections by saline emulsions of the skin and buccal mucous membrane of monkeys killed from two to six days after the onset of the reaction. From the fourth passage monkey, the reaction was also successfully induced in 3 monkeys by means of citrated whole blood injected intravenously. This observation showed the blood to be capable of exciting the reaction from at least the seventh to the thirteenth day after intratracheal inoculation of the donor monkey, but incapable of inducing it in from two to four days. The blood cultures were negative. After an incubation period of six to ten days the animals become listless and drowsy. The conjunctivæ were injected, and small discrete hyperemic macules appeared on the labial mucous membrane. These spots increased in number and sometimes coalesced in the course of two to four days, forming a diffuse, red, granular rash. This rash was generally limited to the labial mucous membrane, but sometimes extended to the inside of the cheeks. Sometimes the individual macules showed a minute bluish-white center characteristic of Koplik spots. From one to several days after the onset, small, discrete, red maculo-papules appeared on the skin, usually coming out first on the face. The rash increased in number and size of the spots and in two or three days extended to the neck, shoulders, upper arm, chest, abdomen and thighs. The character was constant but the extent varied in different animals. By the time the rash on the skin was fully developed the rash on the mucous membrane had begun to fade and soon disappeared. The rash on the skin faded progressively sometimes with a branning desquamation and some pigmentation. From six to ten days after the onset the animal again appeared well. During the period of symptoms, there was a very definite reduction in the total leukocyte count with less regularity. There were in some photophobia, diarrhea and fever. Rhinitis and bronchitis were not present.

In a second article, Blake and Trask¹ have given a more extended account of the changes produced in monkeys and give plates of the microscopical pathology of the lesions of the skin and mucous membrane of the mouth which are essentially identical with the corresponding lesions of measles in man.

The same authors² have shown that monkeys which have recovered

¹ Journal of Experimental Medicine, March 1, 1921, **33**, 413.

² Ibid., May 1, 1921, p. 621.

from experimental measles are immune from infection with the virus of the disease irrespective of whether the virus is of homologous or heterologous origin. In this respect the disease, as produced experimentally in the monkey, corresponds with measles as observed in man.

In a discussion of the paper of Blake and Trask read before the Section on the Diseases of Children, at the meeting of the American Medical Association in Boston, 1921, Anderson¹ who had previously worked on this subject, stated that Blake and Trask had confirmed observations made by them nine years previously.

Of more interest is the statement of Herrman, of New York, concerning vaccination. In 1913, he began the inoculation of infants against the disease. His method was based on the fact that the discharges from the nose and throat in the active stage of the disease just before and while the eruption is beginning to appear, contains the virus of measles, and that in large cities where practically all mothers have had measles, relative immunity is conferred to the offspring which protection gradually disappears. Herrman thought that if infants were inoculated between four and five months of age, the relative and temporary immunity might be converted into a lasting one, or at any rate, one which would persist for a few years and so tide the patient over a period of life in which measles is fraught with the greatest danger. He collected the nasal mucus of children with measles in small swabs or in small capillary tubes. This was applied by touching the mucous membrane of healthy infants between four and five months of age. One hundred and fifty infants have been thus inoculated, and, of these, 25 were definitely known to have been in intimate contact with patients with measles and only 2 have contracted the disease.

Richardson, of Providence, R. I., also stated that he and O'Connor inoculated 75 children with serum from convalescent measles patients and that these children had subsequently been more or less definitely exposed to measles, but none had developed the disease.

Sellards and Bigelow² gave in considerable detail their observations made with reference to the *cause of measles*. Their work on the inoculation of volunteers gave entirely negative results. Their studies are chiefly on blood cultures and they succeeded in isolating, in 25 out of 31 cases, a small pleomorphic Gram-staining bacillus when methods were used for the inhibition of phagocytosis in the cultures. In one instance it was found in considerable numbers that had been grown from inoculations of 0.01 cc of blood. Similar cultures, made in 24 control individuals, resulted in growth in 5 cases. In their morphology and staining reactions, these control cultures resembled closely the strains from measles cases, but fermentation tests showed that at least three of the cultures from control cases were definitely different from the majority of measles strains. Inoculation observations were made in 3 monkeys with cultures from measles cases. In 2 the symptoms were vague, consisting only of profuse erythema and isolated papules. In 1, however, a suggestive cluster of macules and papules developed,

¹ Journal of the American Medical Association, July 16, 1921, p. 192.

² Journal of Medical Research, May, 1921, p. 241.

some of which became petechial. Histologically, these lesions conform to the description of the human lesions. This animal was tested by reinoculation of the same organism and no symptoms developed.

This work, while of considerable interest and while it may lead to the establishment of some definite proof that this organism is the cause of measles, is unfortunately vitiated to a very considerable extent by finding a somewhat similar growth in the controls. The authors point out that the same thing might happen if one were working on lobar pneumonia. The only thing to do is to await further observations and not rush to any hasty conclusion that this organism has anything to do with measles. The history of infectious diseases is full of observations of similar nature which, while they are very plausible, have not stood the test of time and further study.

Nevin and Bittman¹ have made some observations on experimental measles in rabbits and in monkeys. They claim to have succeeded in getting evidence of infection in rabbits and in one instance they believe that they carried the virus through five rabbits and the blood of the fifth rabbit inoculated into a monkey gave typical symptoms of measles. Blood from cases other than measles failed to give evidence of infection. A monkey inoculated with pooled blood from two different cases of measles taken on the third day after the onset of the disease, gave the characteristic symptoms of measles.

This is, I believe, the first time that anyone has reported the possibility of producing the disease in rabbits. In 15 rabbits the symptoms developed in from three to seven days, and were not so marked as in monkeys. In some instances there was a rise in temperature coincident with a decrease in the total leukocyte count, but this was by no means constant. There was not infrequently a leukocytosis on the second, third, or fourth day after injection, followed by a decrease in the total leukocyte count, but the fact that great fluctuations were found in the daily blood counts of these animals prior to the inoculation, led the authors to disregard this as conclusive evidence of measles infection. In 10 instances small hyperemic, slightly elevated spots developed on the mucous membrane of the lips, and in 5 instances these spots showed whitish centers. Twelve rabbits developed in from two to four days, a marked conjunctivitis, with a moderate edema of the lids and lacrimation. Four of the animals developed a slight diarrhea. All of the 15 animals showed erythema of varying degrees, from a slight flush over the chest and in the axillary region, to a general redness in the groin. This comes on from three to eight days after inoculation. In none of these animals was there anything that might be regarded as a typical measles exanthem noted. The authors point out that the reaction on the skin of rabbits after inoculation with cowpox vaccine is not the same as occurs in the human being.

There was marked desquamation beginning from the fifth to the fourteenth day in all of these animals. This occurred both on the shaved and the unshaved portions of the body.

¹ Journal of Infectious Diseases, October, 1921, p. 429.

If the rabbit is found on further investigation to be subject to measles infection, it ought to go a long way toward clearing up the etiology of the disease, as the great expense incurred in using monkeys has rendered extensive investigations almost impossible.

THE SCHICK REACTION IN MEASLES. Inasmuch as measles modifies profoundly a number of biological reactions, both in its incubation and its period of invasion, Lereboullet, P. L. Marie and Brizard¹ have made some observations on 110 children whose ages varied from six months to thirteen years. Previously, Renault and Lévy² have reported 4 cases from which they concluded that measles did not affect the reaction. In the series of the authors first mentioned, there were 59 positive reactions and 51 negative, or about the same proportion as is found in children not suffering from measles. The modification might be in one of two ways, either rendering the child less susceptible, as is the case with measles and the skin reaction of tuberculin, or it might temporarily suspend the immunity to the subject regarding diphtheria and render the reaction more frequently positive.

From the observations of the authors in question, one would conclude that measles and the Schick reaction differs from measles and the other biological reactions. This whole subject is a field for experimental observation which is practically untouched. Studies made along this line might throw a very considerable light upon the processes of immunity.

THE USE OF SERUM FROM MEASLES CONVALESCENTS. Degkwitz³ has made a very noteworthy contribution on the subject of preventing the disease by means of the injection of serum from children taken early in their convalescence. He has worked out experimentally quite a number of the points in connection with such a method of prevention, but, of course, his observations will have to be confirmed by other workers. One of the first points which he took up was to determine the minimum dose of serum that would prove effective. In the first case that he treated, he used 22 ccm. This quantity was diminished, however, and finally was found that as small an amount as 3 ccm. would be successful in preventing the development of measles.

The second question was how late in the period of incubation would the injections prove efficacious. The injections done up to and including the sixth day in children who had never had the disease and who had been undoubtedly exposed to it, remained free from the disease, while those injected on the seventh day developed the disease in spite of the fact that larger doses of serum were used. After the seventh day the injections of serum not only did not prevent the occurrence of the disease, but they in no way modified the appearance or severity of it, nor did it lengthen the period of incubation. He found, however, that by injecting the children earlier than the seventh day with smaller doses of the serum than would be necessary to prevent the occurrence of the disease, that the incubation period was very definitely lengthened, as long as twenty-one or twenty-two days after the exposure, and that the

¹ Bulletins et Mémoires de la Société Médicale des Hôpitaux, August 4, 1921, p. 1210.

² Annales de Médecine, No. 3, 1920.

³ Zeitschrift für Kinderheilkunde, December, 1920, p. 171.

resulting measles was very much lighter than in children who had not received such injections. These children were free from the secondary manifestations of measles such as conjunctivitis, rhinitis and bronchitis, and felt remarkably well during the short course of their disease.

The use of serum from adults who had had the disease in early life was also used when given in large doses in the first three days of the incubation period. It did not prolong the period of incubation but seemed very definitely to cause the attack to be lighter and shorter than in the uninoculated children.

Mumps. THE USE OF ANTIDIPHTHERIC SERUM IN THE TREATMENT OF MUMPS. Cheinisse¹ has made a study of this subject which has attracted a certain amount of attention. Four years ago, Salvaneschi² made a report in which he included 65 cases occurring in the months of January and February, 1917. Thirty-nine who were admitted to the hospital in the first half of January had only a swelling of the parotid which was treated by painting with iodoform collodion and giving a gram of quinine a day. Twenty-five of these patients were apparently well in fifteen days, but 14 had more or less grave complications, either bilateral orchitis with fever, or ear complications, or other things. At the beginning of the complications, particularly of the orchitis, an injection of 1000 units of diphtheritic antitoxin was injected but repeated only in the severe cases. At the end of twenty-four hours the fever had gone down and the swelling of the testicle lessened or disappeared completely in the space of two or three days. Subsequently 26 patients were admitted to the hospital and these were given an injection of serum immediately. All of these showed a prompt disappearance of the parotid swelling, and they had no orchitis or otitis.

Bonnamour and Bardin³ used the same method in the military hospital for contagious diseases at Lyon. Most of the cases showed a very marked diminution of the parotid swelling two to four days after the injection of the serum, together with a considerable lowering of the temperature. Of 65 cases thus treated, 57 had no complication. Of the remaining 8, 5 had an orchitis when they entered the hospital. In these an injection of the serum rapidly caused cessation of pain, and the second injection given the second day, seemed to stop the development of orchitis. Three cases treated showed the development of this complication.

Cilleuls⁴ collected 54 cases from the Cavalry School at Saumur. Thirty-five cases were treated, in which there were 6 cases of orchitis 1 developing the day after the injection and the others six, seven, eight and thirteen days after. Nine case were treated with normal serum, in which 2 subsequently developed orchitis. Four cases of orchitis were treated with antidiphtheritic serum; 1 case with normal serum, and 5 cases without any serum. Those treated with the diphtheritic serum showed a rapid recovery.

These observations are of great interest in view of the fact that we are at last awakening to the fact that the curative action of serums is

¹ La Presse Médicale, August, 20, 1921, p. 666.

² Reforma medica, September 15, 1917.

³ La Presse Médicale, December 22, 1920.

⁴ Soc. de méd. milit. française, May 19, 1921, p. 173.

not exclusively specific. Whether or not further use of antidipltheritic serum in mumps proves to be of any value is a question that can only be settled by future studies. *A priori* one would not expect much from it.

SURGICAL TREATMENT TO PREVENT ORCHITIS IN MUMPS. Ballenger and Elder¹ have come forward with the suggestion of operating to prevent the atrophy of the testicle, which is so liable to occur after involvement of that organ during the course of mumps. The changes they argue are probably due to two factors, one the poisoning of the tissues by mumps toxin, and second, the pressure-necrosis due to the glands swelling against the inelastic tunica albuginea. They approach the subject as if no one had ever done this before and make no mention of previous workers.

The technic suggested is to give the patient an anesthetic, preferably gas-oxygen. The incision is made in the anterior surface of the scrotum through the tunica vaginalis and the testicle delivered. An H-shaped incision is then made in the tunica albuginea and if the swelling is extensive other slits may be made where indicated to relieve pressure. The gland is then wrapped for a few minutes in a towel wet with a hot salt solution then replaced in the tunica vaginalis, a small Penrose cover is inserted and the incision closed layer by layer with interrupted sutures. A 25 per cent ichthyol dressing is applied and held in place by an ordinary suspension. The authors have operated on 3 cases in which the glands are apparently normal after a period of three years in 2 cases and twenty months in 1.

Ethylhydrocuprein Hydrochloride in Experimental Pneumococcus Pleuritis. Kolmer and Sands,² following up certain other studies that were made by the first named author in connection with Idzumi³ made an experimental study of ethylhydrocuprein hydrochloride (optochin). This drug shows a marked bactericidal activity for pneumococci in pleural pus. The action of the drug is too severe to permit the administration of sufficient amounts to individuals to influence materially either the severity of the disease or the death rate of lobar pneumonia, but observations made on pneumococcus meningitis have indicated that it may be possible to inject enough of the drug into closed sacs to raise the pneumococcal activity of the exudates without danger or irritation of the serous membranes or the absorption of sufficient to do any harm to the individual. Thus Kolmer and Idzumi found that injecting 0.0005 gm. per kilo of weight had a distinctly beneficial effect on the course of acute suppurative meningitis in rabbits produced by Type I pneumococci of moderate virulence when administered not later than four to six hours after infection.

In connection with Sands, Kolmer followed up this work using guinea-pigs for observation and he found that as much as 0.02 to 0.03 gm. of the drug per kilo of body weight was the largest amount that was tolerated in intrapleural injections. He also determined that the injection of 1 cc of a 1 to 500 solution into each pleural cavity of a guinea-pig weighing from 350 to 500 gm. produced no irritation of the pleura.

¹ Journal of the American Medical Association, January 26, 1920, p. 1257.

² Journal of Experimental Medicine, 1921, **33**, 693.

³ Journal of Infectious Diseases, 1920, **26**, 355.

Only 1 cc of a twenty-four hour dextrose-blood-broth culture of virus Type I pneumococcus was injected into the right pleural cavity of guinea-pigs which produced an acute purulent exudate on both sides, associated with purulent pericarditis which generally terminates fatally within seventy-two hours with pneumococcus bacteriemia.

The observers found that the injection of 1 cc of a 1 to 500 solution of ethylhydrocuprein hydrochloride into each pleural cavity of guinea-pigs at varying intervals up to twenty-four hours after pleural infection, has usually shown a marked curative influence. Similar results were also observed using dogs in place of guinea-pigs.

Mixtures of ethylhydrocuprein, sodium oleate and boric acid were also shown to have a decided curative effect under the same conditions.

These observations are important in that they point out the possibility of developing an effective therapeutic procedure to be used in cases of infection of closed serous cavities.

Purpura in Pneumococcus Infections. There have been quite a number of reports from various parts of the world chronicling the occurrence of purpura in the course of pneumococcus infections, chiefly in young infants. One of the latest reports is by Bazan¹ who observed 2 cases of his own and who has given a résumé of 7 other cases collected from the literature. Bazan calls attention to the fact that purpura is an extremely rare complication of pneumococcus infections, but that when it occurs, it has a great prognostic value and one can practically always predict a fatal outcome. The type of the pneumococcus was not determined in all cases. Some of the French observers, however, chiefly Nobécourt and Mathieu, found the French Type II. The clinical histories all show practically the same thing, in most cases a high temperature and the general signs of septicemia. The terminal lesions are varied and at autopsy the chief findings are meningitis, pericarditis and lesions in the lungs or intestines.

The whole subject of purpura eruptions in children is in great need of further study. While there are large numbers of clinical descriptions, comparatively little has been done in the way of exact determination of the underlying causes, and nothing at all as to why it occurs in some cases with apparently the same infection and not in others.

Poliomyelitis. THE REPORT OF THE HARVARD COMMISSION ON THE POLIOMYELITIS EPIDEMIC OF 1920. Peabody² has given a short account of the Harvard Infantile Paralysis Commission and their work during the epidemic of poliomyelitis which occurred in Eastern Massachusetts in August, 1920. The epidemic was a small one, only 133 cases being visited by members of the commission. Fifty-one of these were found not to have poliomyelitis. This group included a great variety of conditions and some of the children apparently had no definite disease whatever. A positive diagnosis was made in 75 cases, and in 7 cases a diagnosis was tentatively made but not confirmed, either on account of the absence of characteristic paralysis or lack of permission to perform lumbar puncture. Lumbar puncture was done in 54 cases.

¹ La Semana Médica, Buenos Aires, August 18, 1921, p. 209.

² Boston Medical and Surgical Journal, August 11, 1921, p. 174.

Of special interest are the cases seen in the preparalytic stages of the disease. Everyone is, I think, agreed that epidemic poliomyelitis usually, though not always, starts like an acute general infection, with symptoms suggesting involvement of the meninges, such as stiffness of the neck and pain on flexion. There is nothing pathognomonic about the clinical picture before the onset of paralysis, but one who has had any experience with the disease can, in the presence of an epidemic, pick out certain cases in which the diagnosis is probable. In this stage the study of the spinal fluid is of value. In many cases there is an increase in the number of cells, but, as Draper has shown, the spinal fluid may be normal at the beginning and an increase in the cell count take place only after several days. The great danger in making a diagnosis in the preparalytic stage, basing it on an increase in the number of cells in the spinal fluid, is that other conditions which cause changes in the spinal fluid are not excluded, but, as Peabody points out, in the progress of an epidemic the number of such errors would undoubtedly be very small. Very little is known about the number of people who may have the disease in the preparalytic stage and in whom it may never go any further. The cases studied in the epidemic of 1916 were, for the most part, treated with intraspinal injections of serum, so it was not possible to draw many conclusions as to the natural course of the disease.

In 13 of the cases studied by the Harvard Commission, the diagnosis was made before the onset of paralysis. Of these, only 4, or 31 per cent, became definitely paralyzed, while 9, or 69 per cent, did not develop any paralysis. Draper's figures are about the same. He reported 30 patients, 19 of whom, or 63 per cent, escaped paralysis. These figures that Peabody points out are too small to be used in making any deductions, but it is extremely interesting to compare these with the cases treated in the epidemic of 1916, where the same commission gave intraspinal injections of the serum of patients who had recovered from the disease. In 51 cases, 35, or 69 per cent, recovered without paralysis. Draper treated 46 cases in the same stage with a similar serum and reported that 20, or 43 per cent, escaped paralysis. Amoss and Chesney treated 14 patients with intraspinal, intravenous and subcutaneous injections of serum, and 10, or 71 per cent, showed no paralysis. Zingher, using the same type of serum intraspinally in 54 cases, reported that 41, or 82 per cent, developed no paralysis. Twenty-five of this group were seen in the Willard Parker Hospital and 24, or 96 per cent, did not become paralyzed. Zingher also treated 10 cases with intraspinal injections of normal serum, 9 of which did not develop paralysis. Rose now's results given at another place in this article may be compared with these figures. From what we know of the disease at present, one would say that about 65 per cent of the individuals infected will escape without any paralysis whatever.

These studies point out a truth that is all too frequently overlooked in making reports of the results of therapeutic procedures, and that is one should have a reasonably accurate idea of the natural history of any disease uninfluenced by any treatment whatsoever before making extravagant claims for any method of treatment, as it will very often be found that the results are essentially the same with or without interference.

FAMILY OUTBREAKS OF POLIOMYELITIS. This is a very important subject which is much in need of further careful study. The earlier writers laid no particular stress upon the occurrence of the disease in household epidemics. Wickman, in his study of the epidemic in Sweden, in 1905, called attention to the fact that 4 or more cases were sometimes observed in a single household. One thousand and thirty-one cases were studied in this epidemic in fourteen households, in each of which 4 cases occurred; seven in which 5 cases occurred; and one household in which 8 cases occurred. There is no record made of the number of families or children in any of these houses. He stated that the onset is often simultaneous, or, when it is not, the secondary cases appear in from six to twelve days. Shidler,¹ in an epidemic in Nebraska in which there were 144 cases, reports 4 cases in each of three families and 6 cases in another family. Steifler² relates three instances of 4 cases in a single family, and one instance of 5 in a family. This occurred in Austria in epidemics between the years 1909 and 1913. The New York epidemic in 1916, in which there were more than 81 cases, showed six instances in which 4 members of the same family developed the disease.

Mulsoy and Matousek,³ from whose article I gleaned the above information, report an instance of 4 cases in one family. The household included father, mother and eleven children whose ages ranged from five to twenty-three years. The house was a two story frame cottage of eight rooms with three adjacent lots being used for garden or chicken yards. It was not in a congested part of Chicago, and the sanitary conditions of the house and surroundings were very good. The source of infection could not be determined. It will not be necessary to go into details of the illness of the children affected, but it is important to emphasize the necessity of careful study of future epidemics with reference to more than one case occurring in a family and also with reference to the secondary cases.

Inasmuch as it has been shown that about 65 per cent of the children effected do not develop any paralysis, it is highly important to make careful examinations of all the children of the household where a single case is known to exist. Future reports should also deal in detail with the relation of the cases to the part of the house in which the patient lives. In the New York epidemic of 1916, it was found that most of the cases of the disease occurred on the first and second floors of the taller houses and a very much lesser percentage of the cases on the floors above. The explanation of this is not clear, inasmuch as scarlet fever and diphtheria do not show a tendency to a larger number of cases in the lower stories. It has been suggested that less light and less air may have something to do with it, or that the individuals are more exposed to rodents than dwellers on the upper floors.

There is still a very great deal to be learned about the disease and dogmatic statements by so-called authorities have lead to a considerable amount of misinformation concerning it, especially statements regarding certain points of the epidemiology which can by no means be considered as settled at the present time.

¹ Journal of the American Medical Association, January 22, 1910, 54, 277.

² Wien. klin. Wchnschr., 1915, 28, 1079.

³ Journal of the American Medical Association, January 15, 1921, 76, 159.

TREATMENT OF ACUTE POLIOMYELITIS WITH IMMUNE HORSE SERUM. Rosenow¹ has given a summary of the results which he has obtained in the use of immune horse serum prepared by repeated injection of the pleomorphic streptococcus from poliomyelitis. This serum which Rosenow has prepared was used in an epidemic at Davenport, Iowa, in 1917; in an epidemic at Dubuque, Iowa, in 1918, and since then in sporadic cases by Rosenow and other physicians in various parts of the United States. The serum is given either intravenously or intramuscularly, and not by intraspinal injection. The intraspinal route is not used in view of the fact that injections of horse serum render monkeys more susceptible to the virus and also because the virus is only rarely present in spinal fluid, and also because Rosenow demonstrated by observation that the intraspinal injections failed to protect monkeys against intracerebral inoculations, whereas intravenous injection protected them against properly gauged doses. Rosenow calls attention to the fact that Amoss and Eberson used the intraspinal injections in testing the protective effect of his serum against experimental poliomyelitis in monkeys.

The patients treated have been divided into three groups according to their condition at the time of treatment: Group 1, patients in the preparalytic stage; Group 2, patients with slight paralysis; and Group 3, patients with advanced paralysis. The following table shows the results in 259 cases, 128 of which were treated by other physicians to whom the serum was sent.

SUMMARY OF RESULTS, ACCORDING TO GROUPS, OF ALL PATIENTS TREATED WITH THE SERUM.

Condition of patients.	Patients.	Deaths.	Recovery with residual paralysis.	Complete recovery.	Recovery without developing paralysis.	Early good effects.	Late results unknown.	Effect doubtful or not apparent.	Average cell count.	Average duration of disease at the time of first serum treatment, days.	Average age, years.	Average amount of serum given each patient, cc.
GROUP 1. Patients without paralysis at the time of serum treatment	60	0	0	60	59	59	0	1	114	1.7	5.3	18
Group 2. Patients with slight paralysis at the time of serum treatment	61	0	1	60	0	58	0	3	120	2.1	5.4	22
Group 3. Patients with advanced paralysis at the time of serum treatment	123	18	30	61	0	74	14	34	117	5.8	7.2	32
Sporadic cases	15	1	6	8	..	12	0	3	148	3.4	5.3	49
Total	259	19	37	189	59	203	14	41	119	3.8	6.2	27

¹ Journal of the American Medical Association, August 20, 1921, p. 588.

Rosenow states that the administration of the serum during the febrile stage caused a lowering of both temperature and pulse rate in a large number of each of the four series of cases, the fourth group including sporadic cases. The reflexes, if diminished, became stronger, or, if absent, returned. Restless, irritable, wakeful, children went to sleep soon after the injection, and the mental condition of semicomatose or apathetic children became normal within a short time. In many instances progressive paralysis ceased, or groups of weakened muscles showed increased power. Of 60 patients in the first group treated in the preparalytic stage, all recovered completely without any residual paralysis. In only 1 was there any muscular weakness and in this one it was slight. Early good effects were noted in all but 1 of these series.

In the second group where there was slight paralysis at the time of treatment, all but 1 recovered completely and in this residual paralysis was limited to the shoulder muscles. All but 3 in this series showed good early effects.

In the third group of cases with advanced paralysis, 18 out of 123 died, 30 had residual paralysis, and in 14 the late results as regards paralysis are not known, while 61 recovered completely.

Of the 15 sporadic cases treated, 6 recovered with residual paralysis and 1 patient died.

In all of these series the serum was administered late. The duration of the illness was shortest in the first group, the average being one and one-seventh days. In the second group the average was two and one-tenth days, and in the third group five and five-eighths days. The sporadic cases average three and three-fourths days, a total average of three and three-eighths days. The average amount of serum given in the first group was 18 cc, in the second group 22 cc, in the third group 32 cc and in the sporadic cases 49 cc.

Of the 259 patients treated, 19 died, a mortality of 7.3 per cent. Of these, 7 were moribund at the time of treatment, and in 4 others there was an involvement of the respiratory muscles, and swallowing was difficult because of marked and rapidly advancing paralysis. One two weeks old baby who died seemingly of inanition was given only 5 cc of serum subcutaneously. In eliminating these 11 cases, there remained 248 patients, 8 of whom died, a mortality of 3.2 per cent. These results are far superior to those obtained by other observers using the serum from convalescent persons in the preparalytic stage of the disease. Zingher treated 54 patients, 10 of whom developed paralysis; Amoss and Chesney 14, 6 of whom were paralyzed and 2 died. Peabody reports 51 cases, 16 of which developed paralysis and 5 died. These give a total of 119 patients treated in the preparalytic stage, 26.8 per cent developed paralysis and 5.8 per cent died.

The poliomyelitis serum is being made under Rosenow's supervision and distributed for study by the Mayo Foundation. During the time that the serum is studied no charge is being made for it, the distribution being to physicians capable of making use of it, particularly with reference to noting the results. It is recommended that the serum be given as soon as the diagnosis is established, and every effort should be made

to establish the nature of the disease from suspicious symptoms and spinal puncture before paralysis has set in. There should be no hesitancy however, in giving the serum, even though the diagnosis cannot be made with certainty, as in no case has actual harm been done which might be ascribed to the serum. Even after paralysis has taken place, the serum should be used, as Rosenow believes that he has seen good effects obtained even as long as ten days after paralysis had been noted. As in the use of all other serums, inquiry should be made as to whether the patient has ever had injections of horse serum in any form, such as diphtheria antitoxin, and whether the patient is subject to hay fever or asthma, or has been subject to eczema. Where such history is brought out, desensitization should be practiced by injecting subcutaneously a small amount of the serum, from 0.5 cc to 1 cc one or two hours previous to the injection of the remainder. The serum should be warmed to body temperature and injected intravenously, if possible, or if that is not possible, intramuscularly at the rate of 1 cc per minute. The dose recommended at present is as follows:

Children up to two years of age	5-15 cc.
Children from two to five years of age	10-25 cc.
Children from five to twelve years of age	15-40 cc.
Individuals twelve years of age and older	20-75 cc.

The amount should vary according to the severity of the symptoms. The return of fever and high pulse rate after the initial drop which occurs commonly, the return of symptoms referable to the central nervous system (irritability, twitchings, pain in extremities, rigidity of the neck, etc.), after primary disappearance or diminution of the persistence of these symptoms, are considered indications for giving more serum. All cases showing paralysis should receive at least two injections from twelve to twenty-four hours apart.

IMMOBILIZATION IN POLIOMYELITIS. The question of the treatment of the paralyzed member in poliomyelitis is one of very great importance and while there is not a uniformity of opinion, there is still a tendency toward uniformity and almost all the authorities are in agreement that the best results are obtained by immobilization of the affected parts. This subject is touched on briefly by Desfosses.¹ He calls attention to the danger of contractions and shortenings, and urges that the affected part be placed in a position which gives the muscle the greatest rest, that is where it is never extended, only contracted, and also so that the antagonistic muscles are in a position of rest. He calls attention to the danger of wasting time, that is so frequently done, the resulting contractions and deformities sometimes taking place with great rapidity. He also figures the apparatus of Mackenzie for immobilizing the arm in case of paralysis of the deltoid.

Rabies. **NEGRI BODIES IN THE SALIVARY GLANDS AND OTHER ORGANS IN RABIES.** Jackson² has an important article dealing with this subject and he gives a brief historical note which is of interest. The earliest

¹ La Presse Médicale, February 12, 1921, p. 231.

² Journal of Infectious Diseases, September, 1921, 29, 291.

observations made on the transmission of rabies by using the saliva from a rabid dog were made by Zinke in 1804. He reproduced the disease in a dog, a rabbit and a cock. Subsequent observations by Gruner, Magendie, Hertwig, Rey and others, all working before 1856 and most of them before 1830, secured plenty of evidence of the virulence of the saliva of rabid animals. Reviews of the literature on this subject are given by Högves,¹ Casper² and J. Koch.³ It is a pretty well recognized impression that the saliva of animals infected with street virus is more virulent than those infected with fixed virus. Elsenburg, writing in Virchow's Archives in 1882, reviewed the early literature on the changes in the salivary gland. He believes the process starts as a parenchymatous inflammation and later becomes an exudative process.

Negri's discovery of bodies in the ganglion cells of the brain of rabid animals, in 1903, marked a big step forward in the diagnosis of the disease. Stepanescu was apparently the only observer who has found anything resembling Negri bodies in the salivary glands. All of the other observations along this line have apparently been negative. Jackson was not discouraged, however, and determined to make another study of the subject, securing salivary glands from 18 rabid dogs, and as controls the same glands from 15 normal dogs. Various methods were employed, but, as a whole, the alcoholic eosin and methylene blue was found to be most satisfactory. In studying the glands from normal dogs in 3 cases, it was found they contained numerous granules which stained bright red with rosanilin and bluish-black with iron hematoxylin, but not at all or slightly with eosin. The appearance of these is such as to render almost impossible the differentiation between these and similar delicately stained Negri bodies. These granules occur in the glandular cells, and occasionally in the epithelial cells of the ducts. Organisms were found in the salivary glands of 2 old dogs which were used as controls, but which could easily be mistaken for forms found in the glands of rabid dogs. The salivary glands of rabid dogs showed a variety of changes, some slight and chiefly in the region of the ducts, and in others there was a moderate, but rather uniform distribution of changes throughout the gland. Sometimes only a very small part is involved, while the rest of it appears normal. Bodies identified as the Negri bodies were noted as having the same appearance as forms which had been described in the brains of guinea-pigs by Williams and Lowden.

Jackson believes, in spite of the difficulties met with in the study of the salivary glands of normal or rabid animals, that the changes found in the rabid animals are such as to be distinguished from the normal, these changes being of more extensive involvement.

If Jackson's work can be confirmed by other observers, it will mark a step forward in the study of the problem of the virus of this disease, which has resisted the efforts of scores of talented workers.

ANTIRABIC VACCINATION BY MEANS OF DESICCATED VIRUS. In the early days of the Pasteur dried cord method of producing immunity

¹ Nothnagel's Spec. Path. and Ther., Lyssa, 1897.

² Lubarsch-Ostertag Ergebn. d. Allg. Path., etc., 1900, 7, 662.

³ Kolle and Wassermann: Handbuch path. Mikro-Org., 1913, 8, 832.

in individuals who had been bitten by rabid animals, it was necessary for the injured individual to make a pilgrimage to some medical center where there was a Pasteur Institute or one of the few other places where the treatment could be given. It was cumbersome, expensive and entailed all the discomforts of being away from one's home and occupation. Due to the modifications that have been made, it is now possible to produce the material for antirabic vaccination at a very much reduced cost and, by using thermos bottles or similar devices, the material may be shipped to the attending physician who can give the treatment at home. The method used is so different from the cruder methods of the originator that it may not be out of place to outline what is done at the present time, although Stimson¹ of the United States Public Health Service, outlines the old method in his article on biological therapy.

D'Aunoy² has given an account of the use of what is known as the Harris method of preparing the vaccine and the results obtained over a period of six years at the Rathbone Memorial Laboratories of New Orleans. The virus is prepared by taking full grown, healthy rabbits averaging 2200 gm. and inoculating them intracerebrally with an emulsion of dried fixed virus, the amount used ordinarily being 0.004 mg. of material in 1 cc of sterile salt solution. Injection is made after trephining, the material being introduced through a 24 gauge needle directly into the lateral ventricles. The animals develop rabies after a period of six to seven days and when completely paralyzed they are killed by ether narcosis. The brain and spinal cord are removed under aseptic conditions and placed in a Petri dish covered with cold sterile salt solution and the membranes carefully removed by needles. The brain and cord are placed in a mortar and brought into a coarse paste by the addition of a little salt solution. Carbon dioxide snow is now added and the mixture stirred until the mass is solid. When this happens the material is placed in an ordinary meat grinder previously sterilized and kept at a temperature of about -12°C . for a few hours. The ground material is spread in a thin layer over a cold, porcelain, perforated plate which fits a 25 cm. Scheibler desiccator. A layer of phosphoric anhydride, 2 cm. deep, covers the bottom of the desiccator and acts as the dehydrating agent. A vacuum is now produced of 2 mm. of mercury and the desiccator placed at a temperature of about -12°C . to -18°C . If the material has been spread at a thickness of about 4 mm. it is completely dry within thirty-six hours. The dried material is then scraped off and pulverized in a moisture-free atmosphere. The powdered material is then placed in pyrex glass tubes 125 mm. long by 10 mm. in diameter. These are quickly sealed by flame and stored in a dark place at a maximum temperature of -10°C .

The greatest care is necessary to prevent contamination by other organisms, but the technic has been so perfected as to render the material practically perfect in this regard. There is difficulty in standardizing this dried virus. Harris himself has used as a basis a unit which represented the smallest amount of dried material necessary to infect a rabbit.

¹ Journal of the American Medical Association, January 22, 1921, 76, 241.

² Journal of Infectious Diseases, September, 1921, 29, 261.

D'Aunoy uses the term "minimal infective dose" and defines it as the smallest amount of dried material which, after five days of preparation, will cause paralysis in a 2400 gm. rabbit on the seventh day following intracerebral injection. So many factors enter into the question of infection that its standard is not of any great degree of accuracy, but is useful from a practical standpoint.

The dried virus may be kept in the dark at a temperature of -12° C. over long periods of time without any great loss of strength. Material kept as long as three years has been found still very active. When kept at a room temperature the virus quickly deteriorates and becomes inert after sixty days.

The patient is given 250 minimal infected doses doubling the dose daily until a maximum of 2000 minimal infected doses is reached. As a rule, the virus used is two or three months old. In ordinary cases eleven treatments are given, but in severe injuries, that is, those about the face and scalp, fifteen are given. D'Aunoy believes that immunity may be effected better by repeated small doses, although it is possible to protect animals by means of a few massive doses. In children under three, half the number of injections is given.

In the past six years 1538 patients have been treated. In 662, the animal which bit the patient was shown to be rabid by the microscopical test and in 10 by the biological test. In 866, the attacking animal was not located. Only 1 patient during this period developed the disease. D'Aunoy is of the opinion that the biological test is of little value as many times the brains are badly infected or decomposed, and the animal used for observation dies of purulent meningitis. In none of D'Aunoy's patients has any paralysis been noted or any other untoward effects.

This is a great advance over the methods earlier used in its simplicity of preparation and the shorter length of treatment, the greater protection afforded, and the fewer bad effects. It is highly probable that future study and observation will further simplify this method of producing an immunity.

ANTIRABIC INOCULATION OF DOGS. Considering the length of time that the Pasteur method has been used in the production of an active immunity in human beings, it seems strange that it has not been applied to preventing the disease in animals. Umeno, Vet and Doi¹ have inoculated 31,307 dogs with a loss of only 1 dog and 1 other in which vaccination was not regarded as effective. Quite a number of cases of rabies occurred among dogs which had not been vaccinated. Only two injections were given of a dilution of the brain and spinal cord in a portion of 1 to 5. Six cc of this material per 15 kg. of body weight were used as a dose. The vehicle used in the preparation of the vaccine was a mixture of phenol and glycerin and water, and the material was kept sometimes to diminish its virulence before it was used. One would think that some of the institutions devoted to experimental medicine would work out an accurate method of immunizing dogs to rabies, one in which the dosage was more or less exactly determined.

¹ Kitasato Archives of Experimental Medicine, Tokyo, March 10, 1921, No. 2, vol. 4.

Relapsing Fever in Panama Transmitted by Ticks. A very important piece of work has been done by Bates, Dunn and St. John¹ on the cause of relapsing fever as encountered in Panama where there seem to be several different diseases all running a similar course. For sometime it has been evident that the disease has been transmitted by some suctorial insect, and the observers just mentioned have proved experimentally that the human tick, *Ornithodoros talaje*, is the transmitting agent. These ticks have habits similar to the bedbug, secreting themselves about the beds and room by day and feeding at night. The cause of relapsing fever is a spirochete, (1) described as a spirillum in 1873 by Obermeier. This organism was found naturally in infected human ticks, and 3 volunteers were given the disease, 1 by being bitten by a naturally infected tick; (2) by a hypodermic injection of such insects; and (3) by injection of blood from a rat which had been infected with relapsing fever by material from infected ticks. After the disease had been produced experimentally, the patients were cured by the use of arsphenamine.

The Effect of Tonsillectomy on the Recurrence of Acute Rheumatic Fever and Chorea. St. Lawrence² has made a study of 94 children with reference to the effect of removal of tonsils. Without going into the details of his observations, it may be stated that 85 of these were observed during an average period of three and one-half hours after the operation was performed. In all of these there had been manifestations of rheumatism previously. The changes found were marked hypertrophy in 13 per cent of the cases, moderate in 69, and no enlargement in 18. In 73 per cent of the cases there had been recurring attacks of tonsillitis, and in 7 per cent of these sore throat recurred after the removal of the tonsils. The author states that at least two operations were necessary before the tonsils were completely removed in 22 per cent of the cases.

I have never been able to understand why so many nose and throat operators insist on doing a half way operation when they are attempting to eliminate the tonsils as a focal infection. To my mind, at the present state of my knowledge, the only operation to consider is a complete clean dissection of the tonsils in such a manner that none of it is left after the original operation. If this is properly done, the little after-growths of adenoid tissue which may recur rarely cause any trouble. If it is not properly done, the small piece of tonsil left by so many after the operation is performed, in my experience, gives as much trouble as if the operation had not been performed at all. In St. Lawrence's cases the lymph nodes were enlarged in every case before operation, while in 59 per cent they were impalpable afterward. In 42 cases before the tonsils were removed, there had been one or more attacks of acute rheumatic fever. Following the operation in 35, or 84 per cent, there was no recurrence.

The effect on chorea was not quite so striking. There had been one or more attacks before the removal of the tonsils in 40 cases, and there was no recurrence after the operation in 20, or 50 per cent. In 61 cases there had been previous to operation pains in the bones, joints, or muscles, and there was no recurrence of these in 47 cases, or 77 per cent.

¹ American Journal of Tropical Medicine, July, 1921, p. 183.

² Journal of the American Medical Association, October 16, 1920, p. 1036.

The effect on heart disease is clearly shown in St. Lawrence's series of which 58 cases belong to this class, 12 of whom have suffered at least one attack of cardiac failure before the tonsils were removed. Only 1 patient suffered one attack afterward.

In younger children the tonsils are the most frequent source of infection in cases of so-called rheumatism. In later childhood and adult life, and also to a certain extent in young children, decayed teeth play a very important part. Lambert states that in the clinic in Bellevue there has been a great decrease in rheumatism since the establishment of a dental clinic. This relation of diseased teeth as a source of infection should not be overlooked simply because the child has a bad pair of tonsils.

Scarlet Fever. THE ETIOLOGY OF SCARLET FEVER. In 1918, Pryer¹ described an organism somewhat similar to one reported by Cantacuzene in 1914. This organism is large and has a coccus shape but evidently does not come into the higher bacteria group and suggests yeast in some ways. I must refer the reader to the original article for the details from the laboratory standpoint. The interesting feature which Pryer brings out is that diseases of non-bacterial etiology, and particularly those caused by the protozoa, have a blood picture showing a gradual increase in the eosinophile count usually starting after the total white cell count begins to fall toward normal. I referred to this organism in *PROGRESSIVE MEDICINE*, March, 1919, page 220. It would be interesting to know whether the organism described some years ago by Class has the same characteristics.

EXPERIMENTAL INOCULATIONS IN SCARLET FEVER. George F. and Gladys H. Dick² have made a report on some observations made with reference to the possibility of producing disease by inoculation of the blood. In previous studies they have shown that in the disease a variety of organisms found in the throat may enter the blood stream in small numbers and may be excreted in the urine, but blood cultures in uncomplicated cases failed to reveal any organisms in large numbers, and they were not able to find any one organism with sufficient regularity to suggest any causal relation. Complement-fixation tests with the blood serums of convalescent patients and cutaneous tests failed to demonstrate any specific virus or antigen in the blood serum in early cases, or in extracts of the spleen or lymph nodes in fatal cases. In one instance the serum of the convalescent scarlet fever patient gave a weak complement-fixation with an antigen prepared from scarlet fever throat mucus. Following this suggestion, they found that cultures of the throat mucus, grown in whey and in broth and used as antigens, gave positive results with 54.6 per cent of the convalescent serums tested.

Their inoculation experiments were performed on volunteers, healthy men and women between eighteen and thirty-five years of age, who said they had not had scarlet fever and whose living conditions were such that it was possible for them by following instructions to avoid danger to others. The material was used on the observers themselves first to determine whether or not there was any pathogenic action other than

¹ *Journal of Laboratory and Clinical Medicine*, July, 1921, **6**, 561.

² *Journal of the American Medical Association*, September 3, 1921, p. 782.

the production of scarlet fever. Blood was drawn from 4 uncomplicated scarlet fever patients who had negative Wassermanns. The blood was taken shortly after the onset of the disease and just as the rash was appearing. Within fifteen minutes after the withdrawal, the supernatant blood serums were swabbed on the tonsils of 4 volunteers, 1 being used for each serum. No positive results were obtained. The serums were injected subcutaneously into a series of 6 volunteers from 0.2 cc of serum to 5 cc being used. In no instance was there any local or general reaction. Five cc of whole citrated blood was injected subcutaneously into a series of 5 volunteers and these gave only negative results.

An attempt was then made to learn whether or not the disease was caused by a filtrable virus present in the throat in early cases. Mucus swabbed from the throats of patients in the early stage of scarlet fever was shaken in a small amount of broth and filtered through a Maasen or Berkefeld N filter. In other instances patients were given two ounces of sterile broth to gargle and the gargled broth was filtered. Similar quantities were swabbed over the tonsils and pharynx of 5 volunteers, while the larger amounts from the gargled broth were given to a series of 10 volunteers to gargle immediately after filtering. The results from all of these were negative. The gargled broth was subsequently used in 6 volunteers and given subcutaneously in amounts varying from 0.2 cc to 2 cc. Daily observations were made for local reaction, fever, sore throat, and rash on the skin or palate. The 3 persons who received the 2 cc injections showed a slight local redness and a slight induration at the site of inoculation at the end of twenty-four hours. In 2 cases this had disappeared at the end of forty-eight hours. In 1 case the localized induration lasted four days. Otherwise the results were negative.

A comparison was made of the results with different streptococcus antigens and it was found that a hemolytic streptococcus antigen gave the highest percentage of positive results with scarlet fever serums, and, because they are common in the throats of scarlet fever patients, they were used in inoculation experiments made with pure cultures of the living organisms. The cultures were swabbed on the throats of the volunteers. In 30 observations with 18 strains of hemolytic streptococci, 23 were entirely negative and all were negative as to rash on the skin or palate. Seven of the 30 volunteers developed sore throat associated with fever and leukocytosis, but without any rash. These results the observers regarded as sufficient to abandon this organism as the possible cause of the disease.

Nine inoculation observations were made with a living clear culture of the pleomorphic organism similar to those previously found in cultures of throat, blood and urine in early cases of uncomplicated scarlet fever. It was not possible to prepare a satisfactory antigen on this organism for complement-fixation tests. The strain used was isolated from the throat mucus obtained from a patient with scarlet fever before the rash appeared. It showed such extreme pleomorphism that it was kept under daily observation for three months before it was accepted as a pure culture. The morphology of the organism varied from a very

minute pleomorphic bacilli to longer bacillary and thread forms which were sometimes branched. The organism was sometimes Gram-positive and sometimes negative. Of the 9 volunteers who were inoculated by means of throat swabs, 7 showed no reaction whatever, while 2 developed sore throat with fever, leukocytosis and a rash on the palate. Neither developed any skin rash.

These observations are important because they are a definite attempt to clear up the much vexed problem of the cause of scarlet fever, and it is only by such painstaking work, eliminating one possible organism after another, that the solution will be finally obtained. The observers believe that if this pleomorphic organism has any etiological relation to scarlet fever that it should be possible to produce a typical skin rash by the inoculation of a larger series of individuals.

THE TONSILS IN SCARLET FEVER. An interesting study of this subject has been made by Bullowa.¹ He charted out the sex, age, duration of illness, condition on admission, character of the rash, size of the tonsils, their relation with regards to adhesions, whether or not they are compressed on swallowing, the condition of both anterior and posterior lymph nodes, and the character of the case, in 154 cases of scarlet fever occurring during his service at the Willard Parker Hospital in New York City. He found that in the cases in which there were adhesions, in which, on swallowing, the tonsils do not lie free in the fossæ but are apparently flush with the pillars and adherent to them, that the movements in swallowing compress the tonsils and, therefore, force toxins or organisms into the lymph stream with subsequent inflammatory reaction in the adjacent lymph nodes. This, of course, would be true of other infections of the tonsil, as well as those occurring in the course of scarlet fever.

The author regards the inflamed tonsil very much in the light of a phlegmon on the wall of the pharynx. Cases in which there has been previous tonsillectomy showed little or no involvement of the cervical lymph nodes but where the tonsil is undisturbed and adherent, cervical inflammations were very common and indeed the rule, so that the removal of the tonsil or incision of the plica, so as to uncover the tonsil, prevents some of the severe complications arising from this source. Operative procedures were undertaken in several cases. In 3 the plica was incised, in 2 of these the results were very good, the rapidly enlarging lymph nodes subsiding promptly. In the third severe case in which the plica had been incised on the fifth day, the condition of the patient was temporarily improved, but gangrene of the tonsil set in and permission to perform tonsillectomy being refused, the patient died on the twentieth day. Five cases in the series were operated and the tonsils removed. In 4 of them the results were very satisfactory, while in 1 the patient recovered from the operation but subsequently developed a severe nephritis and convulsions. In all the cases there was very severe involvement of the lymph nodes and markedly adherent tonsils.

While one hesitates to advise operative procedure on patients who are

¹ American Journal of Diseases of Children, July, 1921, p. 29.

as ill as most cases of scarlet fever with marked adenitis are liable to be, there is no questioning the facts that removing the focus of infection affords prompt relief in most instances. I have seen several cases in which very marked cervical adenitis was relieved by removing the badly infected tonsils. These were in children who did not have scarlet fever but who were perhaps as ill as if they had that disease.

PROPHYLACTIC INOCULATION AGAINST SCARLET FEVER. From the abstracts in the *Journal of the American Medical Association*, I have learned that Takahashi¹ has suggested and practiced a method of inoculation which consists of withdrawing the blood of a scarlet fever patient and diluting it with a citrated solution so that 1 cc contains 0.0001 cc of the blood of the patient in normal salt solution. From 0.5 to 1 cc of the solution were injected subcutaneously in Takahashi's 5 children. There was neither local nor general reaction. A second inoculation was made with the blood of another patient obtained on the sixth day and diluted so that 1 cc of the final solution contained 0.1 cc of the blood. Four of the children were injected without any reaction. Takahashi believes that it shows that the smaller injection produced a certain amount of active immunity so that the second injection from scarlet fever virus did not reproduce the disease.

THE TREATMENT OF SCARLET FEVER WITH IMMUNE HUMAN SERUM. Weaver² has given a short report on this subject which he has been studying in the Durand Hospital of the John McCormick Institute for Infectious Diseases in Chicago. He has a short account of the work of others which apparently began with Weisbecker in 1897. In the six years following, reports were made by Huber and Blumenthal, von Leydon, Rumpel and Scholz. The results obtained by these observers were negligible, only small quantities of serum being used subcutaneously, so that the practice was given up. Reiss and Jungmann, in 1912, again tried immune serum, injecting it intravenously in larger doses. They reported favorable results and their work was followed by Koch, and Reiss and Hertz. Zingher, in 1915, used whole citrated blood injected intramuscularly. His results correspond to those obtained by the intravenous injections. In 1918, Kling and Widfelt³ reported on 237 cases, 17.7 per cent died; while in a corresponding group of 91 severe cases in which no serum was given, the mortality was 17 per cent. They were of the opinion that severe toxic cases were benefited.

Weaver⁴ reports on 54 cases including 19 of which he reported previously. These patients represented the most severe cases among about 1200 patients. Thirty-eight were the toxic type, in 6 septic complications were marked, and in 10 marked toxemia was combined with septic complications. Two of the patients died, 1 toxic and 1 septic.

The methods used to inject intramuscularly from 60 to 90 cc of serum, one-half into the muscles on the outer side of the thigh and the remainder on the opposite side. Intravenous injections have no advantage over

¹ Japan Medical World, Tokyo, June 20, 1921, No. 2, vol. 1; The Lancet, September 24, 1921, p. 645.

² Journal of the American Medical Association, October 29, 1921, p. 1420.

³ Hygiea, January 16, p. 1918.

⁴ Journal of Infectious Diseases, March, 1918, p. 211.

the intramuscular route. Where the first dose is not followed by improvement in twenty-four hours, a second has been given. Improvement is noted in the general condition of the patient, and this is usually out of proportion with the changes in the temperature, although two or three hours after the injection the temperature begins to decline and continues to do so for from twenty to thirty-six hours, sometimes reaching normal but usually remains a little above. Subsequently, there is usually a moderate rise followed by a gradual fall to normal. Occasionally, the temperature ends by crisis without any recurrence. The earlier the serum is given in the disease, the more pronounced is the effect on the temperature. When the serum is given on the fourth day, the temperature curve does not differ materially from that of the control cases. It was also noted that the patients who receive the serum early are less likely to have septic complications follow. Sometimes the change for the better is very marked beginning two or three hours after the injection, the restlessness and delirium subside, the pulse improves, cyanosis disappears, and the patient, who appeared to be hopeless, seems well on the road to recovery by the next morning.

The blood used is drawn during the fourth or early in the fifth week of the disease, and only in individuals who are free from all suspicion of tuberculosis, who have a negative Wassermann, and who have passed through a typical scarlet fever without septic complications. Kling and Widfelt obtained the best results with blood drawn during the fourth week, but that taken as late as the seventh week was found to be still active. Blood from some patients is found to be more effective than from others, and serum from individuals who have had mild attacks may be as effective as those who have gone through severe cases. From 200 to 300 cc are taken from a vein at the elbow, this amount being withdrawn from adults and somewhat less from larger children. After the serum is separated from the clot, it is drawn off, that from three or four patients mixed and 0.3 per cent of tricesol added. Cultures are made from the mixture and, if they prove sterile, it is placed in small bottles of 30 cc capacity. The serum has usually been kept several weeks. In a few instances in which the serum had been kept for several months, it seemed to be less effective than the fresher serum. In only 1 of the cases was there any untoward effect. This patient was a young man in a very toxic form of the disease. In one thigh a painful swelling developed at the site of injection and a few days later an abscess formed. This was opened and the pus contained an old blood clot. The pus contained a hemolyzing streptococci which was probably in the patient's own blood, as other patients injected with some of the same lot showed no bad effects.

For use in hospitals and perhaps to a less extent in private practice in the home, this method is at least worthy of trial. I am exceedingly skeptical with most serum treatments that have not been very thoroughly tested, not only by one group of observers but by a large number. There have been so many glowing accounts of therapeutic successes which cannot be duplicated, but that is no reason for not continuing research and even intensive study. I think one should go slow before

recommending these newer methods of treatment for use by the general practitioner.

The Initial Exanthem of Smallpox. Tsurumi and Isono¹ have studied the initial eruption of smallpox, which is well worthy of consideration, inasmuch as it is liable to give rise to mistakes in diagnosis. This initial eruption may be hemorrhagic or not. The hemorrhagic variety appears in spots, in eruptions resembling scarlet fever. These spots do not lose color under pressure. The non-hemorrhagic variety occur as small spots having, in a general way, the appearance of measles, but they are not elevated above the skin and vary in size from small areas to that of a lentil. The eruption occurs most frequently on the inside of the thigh or Simon's thigh triangle, the side of the trunk to the axilla, the upper arm, and around the patella. The initial rash lasts from one to three days, and the non-hemorrhagic variety lasts from twelve to twenty-four hours, and the hemorrhagic until the appearance of the typical eruption. There is no scaling and the typical eruption but rarely occurs on the parts where the initial exanthem has appeared. The observers quoted studied 39 cases and they could not discover any definite relation between this eruption and the formation of pock marks. It is curious that they also observed that in persons who had been vaccinated the eruption was most marked about the site of the vaccination, but if ten years had elapsed this tendency was not apparent. The initial eruption is seen most frequently in cases of varioloid and the cases showing this eruption usually had very light symptoms. The appearance of this eruption cannot, however, be taken always as a sign of a mild case because in several instances the patient showing it died, which was particularly true of those showing hemorrhagic eruption.

Tropical Sprue. This would seem to be an opportune time to emphasize the importance of the physician being reasonably familiar with the disease, which, while it is more common in the tropics than elsewhere, is by no means limited to the hotter climates.

Bovaird² has given a satisfactory, short study and suggests the use of the name *psilosis* as a preferable term for the disease. This malady is a very wide spread one. At first it was thought that only Europeans or Americans living in the tropics were affected, but, on closer study, it was found that the natives not infrequently were infected. The disease has been met with in practically all parts of the tropical regions, and cases occurring in the United States have been reported in individuals who have spent some years in the tropics, contract the disease and then return with it. In some instances the patient comes back in good health, and the first symptoms are noted some months after his return.

The disease is apparently one of older life, and in 13 patients that were studied at the Presbyterian Hospital, New York, the ages varied from thirty-seven to fifty-seven years.

The disease may develop a very long time after leaving the tropics. Bovaird mentions a case in which the disease made its appearance two years after returning from Porto Rico and while living under highly

¹ Journal of Infectious Diseases, August, 1921, 29, 109.

² Journal of the American Medical Association, September 3, 1921, p. 753.

favorable conditions on Long Island. Bahr cites a case of an Englishman who developed the disease seven years after his return, and still another in which seventeen years elapsed between life in the tropics and the onset of the disease. In some instances the disease develops in persons who are closely associated, as though it had been passed from one to the other, or had arisen from some common cause.

Various theories have been advanced as to its cause, but the disease seems to be due to an infection by a form of yeast. Bahr believes that this organism is the *Monilia albicans*, in other words the organism causing thrush. Ashford, on the other hand, believes that it is a hitherto unrecognized species which he calls *Monilia X*. The exact nature of the organism can only be determined by future study, and whether it is the cause or merely a chance invader is still open to question. Bovaird, for example, in his series of 13 patients, found the organism in only 2 instances although search was repeatedly made for it. Two other cases carefully studied did not reveal anything abnormal in the bacterial flora of the intestine. One of these cases died, and the postmortem findings threw no light on the nature of the disease.

There have not been a great many autopsies made on sprue but, from those which have been done, it seems that there are not many changes associated with it. The epithelium of the tongue and various parts of the gastro-intestinal tract are thin and in some places may be wanting. There are sometimes inflammatory changes, and hyaline areas have been described in the spleen.

The clinical picture of the disease is such that it should not be overlooked. The sore mouth, diarrhea, characterized with the passage of from one to four bulky, light-colored, semifluid stools, containing much gas; emaciation, anemia and exhaustion make a symptom-complex which can scarcely be passed over. There may be, however, atypical cases which may be overlooked, particularly as the sore mouth is not always present. The chief disturbance is the diarrhea, and, while the number of stools is, as a rule, not excessive, the character of them and the presence of gas is always suggestive. Many of the patients present sensitiveness of the abdomen for many months at a time, and patients have been operated on under the mistaken diagnosis of appendicitis. The progressive loss of weight is also striking, from 20 to 30 pounds is an average and in one instance a patient weighing 160 pounds came down to 100.

The mouth lesions consist of a patch of erythema, especially at the edge of the tongue, small ulcers exactly like those seen in the aphthous stomatitis in children, and, in some, a smooth, shiny atrophy, apparently the result of previous lesions. There may be a total absence of hydrochloric acid in the stomach contents and an examination of the stools shows an excess of neutral fat. The pancreatic ferment may, or may not, be present. In advanced cases, tetany may occur, and, in these, a marked reduction of the calcium content of the blood has been noted. The diagnosis must be made from the clinical findings.

Various methods of *treatment* have been suggested, chiefly dietetic, and the administration of sodium bicarbonate has been advised. Bovaird

suggests the use of diluted hydrochloric acid in cases in which it is absent from the stomach. The dietetic methods vary. One plan is to place the patient upon strict milk diet, giving castor oil twice a week. Lactic acid milk may be used where fresh milk is not tolerated. Ashford recommends the addition of bananas to the diet after the tenth day and after varying lengths of time, according to the condition of the patient, usually a month or more, salads and other fruits and meats are added. Where milk is not well borne, a diet of chopped meat may be used at the beginning and fruits and salads added later. Without having had any clinical experience, one would think that on general principles, protein milk or milk prepared with calcium caseinate would be of advantage, as it gives such good results in the fermentative diarrheas of early life.

Another good *clinical account* of the disease is by Simon.¹ He calls attention to the fact that Hillary, an English surgeon practicing in the Barbadoes, described a number of cases of so-called "white diarrhea," which bear a close resemblance to the disease as described at the present time. For nearly a century very little was written about the disease, the name of which Simon states is a corruption of the Dutch "spruw," a term applied by the natives of Java to characterize the mouth lesions. Alexander Grant, an English surgeon, in 1853 published in the *Indian Annals of Medical Sciences* the first accurate description. In 1880, Sir Patrick Manson published a series of "Notes on Sprue," which name has been most generally used in describing the disease. We can pass over the description of the disease which does not depart from the foregoing accounts of the clinical findings.

THE TREATMENT OF SPRUE BY MASSIVE DOSES OF SODIUM BICARBONATE. A suggestion in the treatment of sprue has been made by Castellani,² whose opinion on anything bearing on infections or tropical diseases is to be accorded the highest weight. He replaced the usual small doses with very large ones with apparently most beneficial effect, especially on the intestinal symptoms. The routine followed by him is generally the following:

The patient is kept at complete rest in bed and is placed at first on a strict milk diet. The mouth is kept clean by using a diluted alum-carbolic mouth wash, which is replaced by a cocain-carbolic mouth wash if there are painful patches on the tongue. Some milk alkaline tooth paste is recommended for brushing the teeth several times a day. The bicarbonate of soda is given by mouth and also intravenously, using a 2 to 4 per cent solution. Sometimes the administration by mouth is sufficient. For the first three days, 1 dram is given three times daily. For the next eight or ten days, 2 drams three times daily, and afterward 3 drams or more three times daily for several weeks. No bad effects were noticed, but sometimes a patient becomes drowsy, and, if this is marked, the dose should be decreased. If diarrhea is very severe, 5 to 10 grains of salol may be added, but powerful astringents are to be avoided. The salol is also useful when the urine becomes too strongly

¹ Southern Medical Journal, April, 1921, p. 255.

² British Medical Journal, March 5, 1921, p. 338.

alkaline. In the exceptional cases in which there is constipation, magnesium carbonate may be used in 10 to 20-grain doses. Just how the bicarbonate of soda acts is not quite clear, and will have to be the subject of further investigation.

Tuberculosis. ARNETH'S METHOD AND TUBERCULOUS INFECTIONS. The method suggested by Arneth to be applied to the study of tuberculosis and other infectious diseases does not seem to me to have received as much attention as it might well deserve. One of the recent articles is by Bersani.¹ Arneth, it may be recalled, interested himself in the morphology of the nucleus of the polymorphonuclear leukocytes and their evolution. According to Arneth, the greater number of segments in the nucleus, the older the cell, and he divides the leukocytes into five types as follows:

Type I. One nucleus, either round or slightly incurved or largely incurved.

Type II. Two nuclei, either 2 round nuclei, or 2 irregularly shaped nuclei, or 1 round and 1 irregular.

Type III. Three nuclei, either 3 round nuclei, or 3 crenated nuclei, or 2 round and 1 crenated, or 2 irregular and 1 round.

Type IV. Four nuclei, with similar variations.

Type V. Five nuclei, with similar variations.

Normally	5 per cent	of neutrophilic leukocytes	of the 1st type
35	"	"	of the 2d type
41	"	"	of the 3d type
17	"	"	of the 4th type
2	"	"	of the 5th type

Without going into the details of Bersani's observations, we may give his results in the following table, according to changes in the different types of tuberculosis.

Neutrophilic leukocytes.	Light forms, per cent.	Forms of average severity, per cent.	Grave forms, per cent.
Type 1	16	20	28
Type 2	30	40	47
Type 3	36	30	20
Type 4	13	9	5
Type 5	5	1	0

Tularemia. In 1914, Wherry and Lamb reported the finding of *Bacterium tularense* in human beings. Subsequently, Francis² made a report on what was properly known as deer-fly fever. The same observer³ has published a more extensive study of this disease which is due to the organism first mentioned and is transmitted from rodents to man by the bite of an infected blood-sucking insect, or by handling and dissecting infected rodents, by marked motion as in the cases reported by Wherry and Lamb, or of laboratory workers, as in the case of four cases to be reported at a later date.

Studies of Francis were made in Utah where the disease prevails in

¹ Il Policlinico Sezione Pratica, May 9, 1921, p. 655.

² Public Health Reports, September 12, 1919, p. 2061.

³ Ibid., July 29, 1921, p. 1731.

the months of June, July and August, and where it was spread, as Francis believes, by the bite of an insect, most probably the blood-sucking horse fly, *Chrysops discalis*, which previously had bitten a jack rabbit infected with the organism. The bite is usually on some exposed surface of the body, neck, face, hands, or legs, and following it the disease comes on with sudden onset, with pain and fever; the patient is confined to bed; the lymph nodes which drain the area on which the bite is situated become tender, inflamed and swollen, and usually break down, with the formation of pus, requiring incision. The fever is of a septic type and lasts from three to six weeks, followed by slow convalescence, and it may even result in death.

Some two dozen cases occurred in Millard County, Utah, in each of the years 1917, 1918, 1919 and 1920. At the same time the jack rabbits suffered from an epizootic which caused death and which was described first by McCoy.¹ The disease is a formidable one and is liable to affect farmers or those working in the fields. It has no direct bearing on the health of the community, but takes the laborer from his work at the time when the need is greatest.

Francis gives the clinical histories of several cases, from which the following is an example: A farm worker, aged sixteen years, was bitten on June 23d on the posterior surface of the right ear and the following day had a headache and felt badly and went to bed. He noticed a lump behind the right ear. On July 3, the boy had been in bed most of the time for the past nine days, the temperature was 103° F., and the pulse 110. He had a punched out ulcer one-quarter of an inch in diameter on the posterior surface of the right ear. There was an enlarged gland behind the right ear over the mastoid which was beginning to soften. The patient recovered after an illness of about six weeks.

In the same locality and at the same time, Francis had the opportunity of studying the disease as it appears in jack rabbits. The rabbits were shot and immediately dissected on the ground, examination being directed to their lymph nodes, spleen and liver. When these organs showed what was supposed to be suspicious lesions, specimens were taken to the laboratory and rubbed on the abraded skin of the abdomen of a guinea-pig and in cases of the death of the guinea-pig with typical lesions, cultures were made from the spleen and liver of the guinea-pig. Twenty-three rabbits were regarded as suspicious, and, of these, 17 proved to be infected with *Bacterium tularense*. Two hundred and seventy-seven ground squirrels were treated in like manner, and of 3 considered suspicious, 1 was found to be infected with the organism.

In association with Mayne, Francis conducted some observations regarding transmission. They were able to show that the horse fly which had first bitten an infected guinea-pig and tame rabbit in a laboratory can, by its subsequent bites, convey that infection to healthy guinea-pigs which they are allowed to bite. The specimens of the fly used were female adult insects. The only break in the evidence is that the flies were not laboratory grown, but they were collected in the open.

¹ Public Health Bulletin, April, 1911, No. 43.

This would not, however, violate the proof that the fly transmitted the disease. Eleven successful transmissions were made, and there were 27 unsuccessful attempts. No particular reason could be assigned for the failure to transmit the disease in some instances.

In connection with Lake, Francis has shown that the common rabbit louse, *Hæmodipsus ventricosus* (Denny), when taken from rabbits which have died with the typical lesions of tularemia and placed in the hair of healthy rabbits causes the death of the latter with typical lesions. It was also found that nasal secretions of infected rabbits, when dropped in the nares of healthy rabbits and injected subcutaneously in guinea-pigs, produced the disease. It was further shown that the urine of the animals affected contained the organisms. It was found impossible, however, to infect 4 rabbits and 2 guinea-pigs by mixing with their food large quantities of nasal washings or urine from infected rabbits, although they ate the mixture readily. McCoy and Chapin have previously reported the transmission of the disease from squirrel to squirrel by fleas. Just how widespread this disease is, we have no means of stating at present. It is highly probable that it appears in many other places than the localities from which it has been described.

Sporadic cases occurring in human beings would, in almost all probability, escape diagnosis unless they came under the care and attention of a physician of unusual information and skill.

Typhoid Fever. TYPHOID IN THE LARGE CITIES IN THE UNITED STATES IN 1920. For the past nine years the *Journal of the American Medical Association*¹ have made a study of the deaths from typhoid in cities with a population of over 100,000. It will not be necessary to do more than to reproduce two of the tables, one showing the deaths in cities of more than 500,000 and the other those from 300,000 to 500,000 population.

DEATH RATES FROM TYPHOID IN CITIES OF FROM 200,000 TO 300,000
POPULATION.

Deaths from typhoid per 100,000 population.					
	1920.	1919.	Average, 1916-1920.	Average, 1911-1915.	Average, 1906-1910.
Rochester, N. Y. . . .	1.0	3.8	2.9	9.6	12.8
St. Paul, Minn. . . .	2.1	3.0	3.1	9.2	18.3
Columbus, Ohio . . .	2.5	3.0	7.1	15.8	40.0
Portland, Ore. . . .	3.5	3.6	4.5	10.8	23.2
Akron, Ohio	3.7	8.4			
Providence, R. I. . . .	3.8	3.4	4.4	10.2	14.3
Denver, Col.	5.0	3.2	5.8	12.0	37.5
Oakland, Calif. . . .	5.5	3.2	3.8	8.7	21.5
Louisville, Ky. . . .	5.5	9.0	9.7	19.7	52.7
Jersey City, N. J. . .	6.7	2.2	4.5	7.2	12.6
Toledo, Ohio	7.3	3.1	10.6	31.4	37.5
Atlanta, Ga.	12.8	9.6	14.2	31.4	58.4

¹ Journal of the American Medical Association, March 26, 1921, p. 860.

DEATH RATES FROM TYPHOID IN CITIES OF FROM 150,000 TO 200,000
POPULATION.

	Deaths from typhoid per 100,000 population.				
	1920.	1919.	Average, 1916-1920.	Average, 1911-1915.	Average, 1906-1910.
Worcester, Mass. . . .	1.7	2.8	3.5	5.0	11.8
Syracuse, N. Y. . . .	4.0	6.7	7.7	12.3	15.6
New Haven, Conn. . . .	6.1	5.7	6.8	18.2	30.8
Richmond, Va. . . .	6.4	3.7	9.7	15.7	34.0
Dayton, Ohio	7.1	4.5	9.3	14.8	22.5
Omaha, Neb. . . .	7.8	4.4	5.7	14.9	40.7
Memphis, Tenn. . . .	8.0	58.4	27.7	42.5	35.5
San Antonio, Texas . . .	9.9	9.6	23.3	29.5	
Dallas, Texas	14.3	12.2	17.2		
Birmingham, Ala. . . .	14.4	14.6	31.5		

The typhoid figures used to be commented upon frequently by Mr. H. L. Mencken in his "Free Lance" column formerly run in the *Baltimore Evening Sun*. He always referred to the batting average of the Typhoid League and worked the rates out in percentages, making such comment as might be fitting. A study of these tables shows what remarkable betterment has come about in the typhoid situation. One might almost say that the improvement has been unbelievable. Take Philadelphia between 1906 and 1910, with an average of 41.7 deaths per 100,000 population, whereas in 1920 the number was only 3.3. Even better, take Pittsburgh, with 65.0 deaths per 100,000 between 1906 and 1910, and with a present rate of only 2.7. One gets some idea of the enormous saving that has been made in the morbidity and mortality of typhoid fever to which scourge more of the growth of the country have been sacrificed than were ever thrown to the Minotaur of ancient Crete.

Typhus Fever. THE ETIOLOGY OF TYPHUS FEVER. In 1914, Plotz and his associates described an organism which has been practically accepted by authors of text-books on bacteriology as the cause of typhus fever. This organism, which I commented on in previous issues of *PROGRESSIVE MEDICINE*, is a small pleomorphic Gram-positive bacillus, non-motile, not encapsulated and not acid fast. When suitably stained, it occasionally shows a small polar body at one or sometimes both ends. This germ has been isolated both from Brill's disease and from epidemic typhus fever. It has been grown from typhus-infected animals and from infected lice.

Schulze¹ has published an article from his "Closing Report of the Bureau of Medical Research of the American Red Cross Commission to Poland." In this article he states that he does not believe that the studies made by Plotz can be said to show more than the fact that the organism is found in typhus fever patients. He calls attention to the fact that Plotz and his associates did not succeed in reproducing even

¹ American Journal of the Medical Sciences, January, 1921, p. 78.

the disease picture in animals. The reason given being the extremely rapid loss of virulence, nor were immunity reactions produced by inoculating animals. They claim that the evidence that this organism is the cause of the disease rests upon cultural and serological grounds.

In 1915, Weil and Felix isolated from the urine of typhus fever patients two strains of *proteus vulgaris* which they named X1 and X2. These were found to be markedly agglutinated by the sera from typhus fever patients and this has led to the use of this organism in the laboratory diagnosis of the disease. Subsequently, in 1916, they isolated another strain of this bacillus, which they named X19. This organism was agglutinated in dilutions many times higher than either of the other two which it has replaced in laboratory diagnosis. This organism was believed by some, Friedberger for example, to be the cause of typhus fever but it was shown that this organism would not immunize guinea-pigs against typhus fever, and animals infected with it, inoculated with blood from typhus fever patients, developed typhus fever. This *proteus* X19 was, therefore, an instance of an organism which occurs with remarkable regularity in typhus fever and yet which apparently bears no etiological relationship to the disease.

Schultz outlines the work which has been done upon the so-called Rickettsia. Some ten years ago Ricketts and Wilder were working on the etiology of typhus fever in Mexico. They found in smears from the digestive tracts of infected lice which they stained by the Giemsa method, minute organisms which showed the characteristic bipolar staining. They also found the same organism, occasionally in smears from normal lice. These organisms have been confirmed by Prowazek, and others. In 1915, da Rocha-Lima studied lice by histological methods and found that there was an intracellular parasite in the epithelial cells particularly of the gasterium in typhus infected lice. The control examination showed that these were not found in lice obtained in typhus free regions. These organisms are very small, smaller than the *M. melitensis* and frequently occurred in double forms. With the Giemsa they stain differently than do bacteria which stain a dark red or an outspoken blue, while the organisms in question stain a pale, ruby-red more like the coloration which is obtained by this method on spirochetes. This organism da Rocha-Lima proposed to call "*Rickettsia-Prowazeki*" in honor of the two gifted scientists who sacrificed their lives in the study of typhus fever. Da Rocha-Lima was able to infect guinea-pigs with typhus fever by inoculation with emulsions prepared from the organs of virulent lice and the animals so inoculated on recovery were found to be immune to inoculations with blood from typhus fever patients. He also found that the infectivity of such emulsions was in direct proportion to the numerical content of Rickettsia. He was also able to immunize guinea-pigs with a vaccine prepared from virulent lice. The organism which was the source of confusion to Ricketts and Wilder and others, that is the one found in normal lice, has been apparently cleared up by da Rocha-Lima, who found that these bodies did not invade the cells but were in a rather thick layer on the mucous membrane, and he further observed that while this organism was somewhat smaller, it had certain differences.

Schultz believes that there is no conclusive evidence that the organism described by Plotz is the cause of typhus fever and proteus X19 he believes also to be a secondary invader. He recognizes the possibility of a state of symbiosis. He makes the statement that the *Rickettsia-Prowazeki* are probably the cause of typhus fever. Clinically, he points out that the exanthem and the limited course of the disease seem to point to a protozoan cause and he likewise records, as suggestive, the characteristic onset with chills. The fact that the Wassermann reaction is found at the height of the disease in practically 90 per cent of the cases points to a protozoan-like cause of the disease. The *Rickettsia* apparently belonged to a new group of microorganisms, which are probably more closely related to the protozoa than to the bacteria and make a point of departure for further studies, not only of typhus, but of other diseases in which the etiological factor has not been as yet determined.

Vincent's Angina. This disease, which is first described by Vincent in 1898, is of very much more importance than is ordinarily supposed and it is highly probable that a certain number of cases which are supposed to be diphtheria or syphilis are due to Vincent's organism.

Reckord and Baker¹ made a report on 56 cases. The disease apparently has a well-marked seasonal variation, occurring most frequently during the winter months. Rolleston, in a paper in which he reported 32 cases observed in children, found the disease most frequently in the spring.

The typical lesion consists of a heavy, dirty-looking membrane covering both tonsils though it may appear on any place, on the membrane of the mouth, nose or throat. The membrane is coated with ulceration which sometimes causes considerable destruction, and there may be actual gangrene in connection with it. In a small percentage of cases there is a definite history of infection or exposure to the disease in another individual.

The onset is usually, but not always, sudden, and there is generally some malaise, although not always. Headache, backache, and pain on swallowing are usually complained of, and, in the majority of cases, there is enlargement of the cervical lymph nodes.

In some instances the disease occurs in individuals having syphilis, and a positive Wassermann reaction may cause a mistake in diagnosis unless the stained smears are examined. Using the dark field method, spirochetes, accompanied with the fusiform bacilli, may be demonstrated or the organisms may be stained.

The difference in diagnosis from diphtheria is laid on the fact that in diphtheria there are often severe constitutional symptoms, the affection is usually bilateral there is not much pain on swallowing, the membrane is difficult to remove, and the diphtheria bacillus can almost always be demonstrated. The authors give also the relative absence of tenderness of the submaxillary lymphatic glands, but I should think that this was a sign on which very little reliance could be placed.

The treatment that is found most satisfactory is a 10 per cent solution

¹ Journal of the American Medical Association, December 11, 1920, p. 1620.

of arsphenamine in glycerin. This is prepared by dissolving 0.6 gm. in 2 drams of glycerin. This solution seems to be reasonably stable. The parts to be treated should be thoroughly cleansed and dried, and the solution applied by small cotton swabs and rubbed into the lesions. Under this treatment, the disease usually disappears rapidly. Other solutions which have given good results are the 2 per cent solution of chromic acid, tincture of iodine, colloidal silver, flavine, and a mixture composed of a half ounce of wine of ipecacuanhæ and an ounce each of glycerin and Fowler's solution. Powdered methylene blue has also been used. To this list one might add a saturated solution of dahlia, one of the aniline dyes. The arsphenamine solution seems, however, to give the quickest results.

Herpes Zoster and Varicella. Last year I called attention to the possibility of a common origin of chicken-pox in certain cases of herpes, commenting on the observations of Netter and Ker. Since that time there have been a large number of contributions, chiefly in the English medical press either in the form of articles or of letters. Among others is the contribution by Carver.¹ He reports 3 instances in which the children living in a country house were together on the street car on September 4. This was the last occasion in which they were away from home together in any enclosed or crowded place. On October 1, one child developed chicken-pox at school to which she returned on September 22. On October 3, another child developed the disease at home, and, on October 4, the third child developed it at another school two hundred miles away to which she had gone for her first term on September 21. While staying in a house in which they had spent the holidays, the children's grandmother suffered an attack of supraorbital herpes which eruption began to appear on September 14.

Robson² reports another instance, in which, on January 10, he saw a woman with typical herpes zoster. On January 25, fifteen days after the herpes appeared, one of her daughters developed typical chicken-pox and three days later the second daughter also developed a typical case of the disease. Both daughters had had chicken-pox twenty years before.

Low³ has collected a considerable bibliography on this subject to which anyone especially interested may refer. The reports given above are fair samples of a number of others. If every practising physician would carefully report instances of this kind, the results could be summarized and after a few years, as Ker points out, some definite conclusion might be arrived at. Of course, the explanation given by those who urge the common origin of the two diseases is that when chicken-pox occurs it is due to a blood infection, but when herpes develops it is due to the virus being distributed along lymph channels.

Waskia Intestinalis. In 1917, Wenyon and O'Connor working under the Wellcome Bureau of Scientific Research, described a small flagellate organism in the stools of 2 patients in an army hospital in Alexandria, Egypt. They did not regard the organism as pathogenic.

¹ British Medical Journal, February 12, 1921, p. 227.

² Ibid., February 24, 1921, p. 228.

³ Ibid., p. 1913.

Since then Kofoed, Kornhauser and Plate have reported 7 instances of infection from a debarkation hospital in New York, of this organism in soldiers, 3 from overseas and 4 in the home service. These patients were suffering with diarrhea, but had, in addition to the *Waskia*, from three to six other parasites in the intestinal tract.

Hogue¹ reports an instance in a woman who had never been out of the United States and had spent most of her time in Pennsylvania and Maryland. She had suffered many years with diarrhea. The *Waskia intestinalis* was isolated from the stool and culture kept under observation for over eight weeks, transplants being made every other day.

The organism is a small, active flagellate, measuring in stained preparations from 5.6 to 7.2 microns in length and from 4 to 4.8 microns in width. There is a rather large cystostome and two anterior flagella. The cysts are pear-shaped and measure from 4.8 to 7.2 microns in length and from 4 to 4.8 microns in width. In culture media, they appear as small, light yellow, refractive bodies.

It seems highly probably that a new parasitic organism is being spread through this country. With the increased travel in tropical countries, it is to be expected that most of the foreign parasites will sooner or later be imported into this country.

Whooping Cough Contracted at the Time of Birth. Phillips² has reported 2 instances of whooping cough contracted at the time of birth, the source of infection of each case being an obstetric nurse who was in the first week of her attack of whooping cough. The first patient was two weeks premature and the baby weighed five pounds and ten ounces. On the tenth day the child began to cough, and the next two days the cough increased in severity so that it interfered with nursing, and the food was regurgitated. On the fourteenth day after birth, the infant began to whoop. On the nineteenth day there were thirty paroxysms during which the child was deeply cyanosed and at times it was with great difficulty that breathing was again established. The child became stuporous on the twenty-first day, and a few hours later sank into coma. There was increased intracranial pressure and paralysis of one side of the face, together with Cheyne-Stokes breathing. No autopsy was permitted, but death was evidently due to hemorrhage of the brain.

The second case was a child, born at full term, and the same nurse was present. This child began to cough eight days after birth and whooped on the twelfth day. The disease ran a moderately severe course for six weeks and recovered entirely without any apparent influence on the future health.

There have been instances reported in which children have been born with whooping cough, and Cochain³ states that a case has been described by Sir Thomas Watson in which the disease was contracted before the patient was born. The statement being, "My bed-maker's daughter in Cambridge had a child ill with whooping cough in the house with her during the first months of pregnancy, and the newcomer

¹ Journal of the American Medical Association, July 9, 1921, p. 112.

² American Journal of Medical Sciences, February, 1921, p. 163.

³ British Journal of Diseases of Children, July 10, 1913, p. 534.

whooped the first day of his appearance into the world." Rilliet and Barthez record a case of a newborn child whose mother had whooping cough for a month and who had characteristic fits of coughing on the first day.

Cole has also reported a case in which the child whooped on the third day. In this instance the mother had developed whooping cough in six months pregnancy and the child was born one month prematurely. Whooping did not occur typically until the seventeenth day after birth.

There have been instances reported in which the child was born with whooping cough in which the mother had been caring for children suffering with the disease, and there are instances recorded in which the mother had whooping cough and the child was born without it and suffered no subsequent infection, at any rate during infancy.

TREATMENT OF WHOOPING COUGH WITH SILVER NITRATE. Almost every drug in the pharmacopœia has at one time or another been used in the treatment of whooping cough, only to be abandoned later. A rather interesting suggestion was made some years ago, in 1913 to be exact, by Ochsenius. He suggested the painting of the nasopharynx with 2 per cent solution of silver nitrate, every other day first, and later at longer intervals. In his first article he reported 95 cases in which good results were obtained in 84. Three years later he had increased his material to 447 cases, in most of whom successful results had been obtained.

Now Lederer¹ has a short article on the subject in which he believes that perhaps the success of this method of treatment consists in suggestion and not, as its originator thought, on its bactericidal action. Lederer remarks that the treatment is usually accompanied with the suggestion to the child that "you will be treated as long as you cough." In some very nervous children who struggle and try to prevent being treated, the results are unfavorable. Sometimes remarkable results are obtained in prolonged cases, which in all probability the cough is merely the nervous manifestation following whooping cough. These are sometimes entirely cured by one application.

This method of treatment, while not to be generally recommended, may be borne in mind in dealing with cases which run on unduly long or in certain other selected instances.

Paralysis in Children Due to the Bite of Wood Ticks. This interesting subject has been reported on by McCormack,² who states that in 1903, while making an examination of a woman, aged twenty-two, years, suffering from an almost complete motor paralysis of the extremities, a large wood-tick was found in the skin at the top of the spine. Immediately following its removal, improvement in the patient's condition began, ending in complete recovery. This case was not reported at that time but McCormack goes on to state that in the last eleven years he has encountered 10 cases of paralysis in children due to tick bites.

In going over the subject, Borthwick, in 1905, reported that in a large area of Cape Colony there was a form of paralysis in sheep which the

¹ Wiener Klinische Wochenschrift, 1920, No. 48, **33**, 1049.

² Journal of the American Medical Association, July 23, 1921, p. 260.

farmers themselves had for a long time attributed to tick bites. In 1912, Sentinel reported from eastern Oregon 4 cases of his own and 9 of other physicians of acute ascending paralysis in children, associated with bites of a wood tick. Both of these contributions are noted by Nuttall¹ in his article on Tick Paralysis in Man and Animals. Todd, from a collective investigation, reported 9 cases in children where tick bites had been followed by paresis, paralysis, and in some cases by death, and subsequently, in 1914, he added 2 additional cases. Cases were reported by Bishopp and King from Montana, and Hadwen and Seymour were able to produce the disease experimentally in sheep, and the following year Strickland reported a case from Australia.

The disease is practically confined to children, but this has been explained by the fact that grown people usually find the ticks and brush them off. Among sheep it has been noted that the yearlings alone become ill, the older animals having apparently acquired immunity. There is no record of second attacks either in man or in animals.

The tick most commonly found is *Dermacentor venustus* which is also responsible for the transmission of Rocky Mountain spotted fever. In animals, the ticks are usually found along the spine, and the number of ticks found does not seem to bear any relation to the severity of the affection. In man usually one tick is found, but sometimes more, and the axilla, the ear, the temporal region and the occiput are the favorite sites. The disease has been reproduced experimentally by tick bites but not by inoculation, and cultures from animals have remained sterile. In sheep, total paralysis has followed on the eighth day after the attachment of the tick. Improvement begins on the ninth day and recovery in one instance was complete on the twelfth day, without the removal of the tick. The disease has not been reproduced by inoculation of susceptible animals with mashed ticks. The ticks may cause the death of guinea-pigs in from five to seven days after the application, and paralysis has also been produced in a dog in nine days.

The exact nature of the disease is still in doubt. It may be that the disease is the result of infection, with an incubation period of from six to eight days, or it may be that there is a toxin developed in the tick which may cause the trouble.

The symptoms begin suddenly in previously healthy children, with weakness in the extremities, staggering, difficulty in standing and disinclination to play, rapidly followed in a few hours by a more or less complete motor paralysis. The child is often unable to stand or to hold the head erect, or to feed himself. The consciousness is not affected. There may be convulsions at the onset, and rapid pulse and a slight temperature have been reported. If the tick is found and removed, the paralysis disappears occasionally, that is usually within twenty-four to forty-eight hours. If the tick is not removed entirely or is removed after an extensive paralysis has occurred, death may follow from respiratory failure.

The diagnosis should be more or less easy in places in which the dis-

¹ Parasitology, 1914, 7, 95.

ease is found owing to the rapidly appearing extensive motor paralysis, but the disease would have to be differentiated from encephalitis, poliomyelitis and meningitis. In one case in which a complete blood examination was made, there was an eosinophilia.

The treatment consists in removing the tick completely and McCormack says that great care must be exercised in removing the head of the tick, as otherwise improvement in the symptoms may not occur. The parasite may be removed by gentle traction, the tick may be covered with grease and when he moves to breathe, may be taken off, or a lighted match may be held beneath the tick until it is too hot for it to remain. Kerosene or chloroform may also be used to force the tick to loosen its hold.

Canine Paraplegia. In connection with the above subject a report by Gwyn¹ is of particular interest. He noted, in the years 1905-1909, at the United States Quarantine Station, Blackbeard Island, Ga., a disease known locally by the name of *staggers*, which occurred among a pack of hunting hounds. The disease was characterized by weakness of the hind quarters which caused a very unsteady gait, the animal lurching from side to side and stumbling with the hind feet. The weakness steadily increased until the dog was unable to stand but dragged himself by his forelegs while the hind legs dragged along the ground. There was no incontinence of urine or feces. The dogs were found to be covered with masses of wood ticks and the severity and rapidity of onset of paralysis seemed to be closely associated with the numbers of ticks found. The ticks showed a predilection for the ears, particularly the parts not covered by hair. Where there was only one tick found, the animals were unaffected. When the ticks were removed the dogs recovered their former health and strength. The cattle of the neighborhood occasionally had a solitary tick on them but none suffered with paralysis, and wild deer, wild ducks and raccoons, such as were examined, were found free from the parasites.

Yellow Fever. EXPERIMENTAL STUDIES ON YELLOW FEVER IN NORTHERN PERU. This disease has been a subject of further studies by Noguchi² in connection with Kligler. The *Leptospira icteroides* was isolated from certain cases of yellow fever in Guayaquil and later from a case in Merida. It was, therefore, concluded to study the disease as it occurred in Northern Peru, with reference to the occurrence of the *Leptospira icteroides*. Fourteen typical cases were studied during an epidemic occurring in 1920. The methods employed were those used in previous observations but were made under unusual difficulties owing to the lack of facilities in the localities in which the observations were made. During the course of the observations, one or two practical points were brought out: (1) the importance of using fresh rabbit serum for culture media; and (2) the variation and susceptibility of guinea pigs to infection with *Leptospira icteroides*. The native guinea-pigs procured in Payta were found to be more resistant than those recently brought from New York. Without going into the details of the observa-

¹ Journal of the American Medical Association, October 1, 1921, p. 1120.

² Journal of Experimental Medicine, February 1, 1921, p. 239.

tions, it may be stated that the *Leptospira icteroides* was demonstrated in the majority of the cases studied.

EXPERIMENTAL TRANSMISSION OF YELLOW FEVER. The brilliant work of Noguchi along this line has been confirmed by a special commission composed of González Fabela, Julián Méndez and Perez Grovas. The latter¹ has given a résumé of the results in a recent article. Owing to the fact that I gave the details of Noguchi's work last year, it will not be necessary to go into the report very fully but I may state that Noguchi's observations have been amply confirmed, as this commission was able to reproduce the disease in guinea-pigs using the blood of patients taken during the third or fourth day of illness. With the culture medium and the technic described by Noguchi, they were able to procure pure cultures of *Leptospira icteroides*, and the organism isolated in the studies which were made in Vera Cruz has the same characteristics as that described by Noguchi in yellow fever in Guayaquil. The disease, as produced in the guinea-pig, was carried on in a large number of animals, and the passage of the leptospira shortened the period of incubation and increased the virulence. This is to be regarded as an important contribution as every fact in scientific medicine should be confirmed by other workers no matter who the original observer.

PROPHYLACTIC AND SERUM THERAPY OF YELLOW FEVER. Noguchi² has prepared an immune serum in the horse and has shown that, in the experimental disease in guinea-pigs, the serum has a definite value in checking the progress of the infection and if it is administered during the period of incubation it is capable of completely preventing the development of the disease. If used in the early stages of the infection, it modifies the course of the disease so as to prevent a fatal outcome. But if the administration is put off until jaundice and nephritis has been present from two to three days, the serum has no beneficial effect whatever. The serum which Noguchi used was of such strength that 1 cc was capable of neutralizing 5,000,000 minimum lethal doses. It was found that the disease in guinea-pigs could be prevented when 0.1 cc of the serum was injected at anytime during the period of incubation, that is, during the first seventy-two hours after inoculation. The serum was first tried in man in September, 1919, and since that time until December 31, 1920, 170 patients have been so treated.

The difference in the death rate between the treated and untreated cases in the various localities is very striking. The results of serum treatment in the various localities shows a general agreement, the earlier the serum is given, the lower the mortality. In 59 patients treated on, or before, the third day, 55 recovered and 4 died. The general experience is that if the serum is injected on or before the third day, that the mortality is reduced, but that if injected after the third day, it has no effect on the course of the disease. The figures in the available cases show that those treated on or before the third day show an average mortality of 13.6 per cent, and, excluding one group of cases treated at Tuxpan, Mexico, the mortality was 6.7 per cent, whereas those treated

¹ Journal of the American Medical Association, February 5, 1921, p. 362.

² Ibid., July 16, 1921, p. 181.

after the fourth day, the average mortality is 52 per cent. The death rate from the disease in the various localities when not treated with serum shows an average mortality of 56.4.

The subject of vaccination as a preventative measure has also been considered. Noguchi had previously demonstrated that injections of killed cultures of the *Leptospira icteroides*, into susceptible animals, conferred a state of immunity which lasts at least five or six months and very probably longer. The first observations in man were made at Guayaquil. The vaccine used at this time was of a rather low potency but the results were striking; 4000 persons were studied, 427 vaccinated and 3574 not vaccinated. In the same period of time the incidence of yellow fever in the vaccinated was 11 per thousand as compared with 110 per thousand in the non-vaccinated. Since then the vaccine has been increased in strength and, when possible, two subcutaneous injections of 2 cc each have been given. The incidence of yellow fever among the vaccinated may be considered in two groups. First, those in whom the disease developed within a comparatively short time, that is from one to ten days after the time of the last inoculation; and secondly, those in whom infection took place one month or longer after vaccination. The longest incubation period in yellow fever in man is twelve days and the average from three to six days, so that the individuals in the first group must be excluded from consideration of the protective effect of the vaccination.

In an epidemic which broke out in Salvador in May, 1920, 3607 persons were vaccinated. Of these, there were 5 suspicious cases, in all of which the diagnosis was extremely doubtful. There were also 5 suspicious or uninformed cases developed before protection. In considering 109,000 non-vaccinated individuals, there were 181 cases of yellow fever or an incidence of 1.6 per thousand. In Tuxpan, in a total population of 6000, 2000 were vaccinated and 4000 were not. In the 2000 vaccinated, 17 cases occurred before protection was established and none afterward. In the 4000 non-vaccinated there were 95 cases of yellow fever, or an incidence of 23.8 per thousand. The protection resulting from vaccination does not become effective for ten days after the last injection.

DISEASES OF CHILDREN.

By STAFFORD McLEAN, M.D.

PREMATURITY—NEW-BORN—MATERNAL NURSING.

A Preliminary Report of the Study of Breast Feeding in Minneapolis. Sedgwick¹ has presented a valuable report on conditions relating to maternal nursing in Minneapolis. This report is so instructive and stimulating that we regret that space will not permit us to reproduce the article in its entirety.

In the new-born clinic, in 1000 consecutive cases, the infant was at the breast at the time of discharge from the hospital. He proves that the demand made upon the breast is the most important factor in the maintenance of the breast milk supply and that the giving of large quantities of fluid is relatively unimportant. Repeated, regular, and complete evacuation of the breasts by a vigorous baby is the best method of conserving the milk supply. When the stimulus to the breast is inadequate, the milk in consequence fails rapidly, and finally is insufficient for the needs of the child. In these cases he uses artificial aid so successfully that he is able to maintain lactation for months without putting the baby to the breast. He states, "We apply the same principles that the milk-maid applies. She does not stroke the cow's udder. She grasps the teats only. We do not massage or stroke the breasts over the glandular tissue as this often causes injury. We grasp the breast just back of the colored areola, press the forefinger and thumb together, thus closing off the sinuses. Then, using a milking motion, push forward then outward, thus emptying the ducts and sinuses to the nipple itself. This should be done gently and should not be painful. No trauma should be done the nipple and the gland tissue of the breast itself is not injured."

He finds this method quite as successful with mothers of premature babies as with those of normal children, and in some cases the mother has been able to furnish milk for her own infant and for another as well. Even in breasts with inverted nipples he finds his method advantageous.

The final figures for Minneapolis were not available when his paper was presented, but 96 per cent were being nursed at the end of the second month, and 72 per cent at the end of the ninth month when the data was collected.

The figures regarding breast feeding in Minneapolis make the abstractor feel that medical men who live elsewhere are not doing their full duty toward their patients. I doubt if similar data collected from any city in the world of the same size would approach those of Minneapolis. The single factor responsible for this is undoubtedly the personality of Sedgwick. He has made breast feeding popular in his own city and

¹ American Journal of the Diseases of Children, May, 1921, No. 5, vol. 21.

through years of unflagging effort, has created the feeling in the Minneapolis mother that she not only can, but must, nurse her baby. It is to be regretted that every community has not its Sedgwick. That we can do more toward educating mothers along the lines indicated by him there is little doubt. The responsibility lies primarily with the physician who delivers the child; he has the best opportunity to instruct the mother in what may be called the Sedgwick technic. In a great center of population like New York, the physician has not the same control over his patients as does his confrère in the smaller community, yet I venture to guess that the per cent of nursing infants is not lower in New York City than in the remainder of the State outside the city. I doubt if 40 per cent of mothers in New York City nurse their infants for nine months.

A Clinical Study of the Premature Infant. Cook,¹ in a study of 77 cases of premature infants, noted that among 60 cases cared for under the old system of hot water bottles placed in a clothes basket there was mortality of 46.6 per cent as contrasted with a mortality of 29 per cent among the remaining 17 who had the benefit of care in an incubator room with air and humidity control. A number of other conditions relating to the mortality of prematurity are discussed in Cook's analysis, but, owing to the limited number of cases involved, the deductions are of limited value. It is interesting to note, however, that one or more complications were noted during the first two weeks of life among 28 infants, of whom 15 died; hemorrhagic disease occurring among 7, with a mortality of 100 per cent.

In his notes on the feeding of these premature infants, he states that breast milk was available for all but 5 of the infants, 19 received it exclusively, while the remainder were given supplemental feedings of modified cow's milk.

There were 33 deaths among Cook's 77 cases, or a gross mortality of 43 per cent. Nineteen, or 57 per cent of the total number of deaths occurred on the first day. Of the remaining 58 cases, the mortality was 24 per cent. These figures compare favorably with the previous reports of others. It is to be regretted that the usual reports regarding premature infants are only carried to the point when they are discharged from the hospital, generally between the ages of six weeks and three months. It would be even more instructive to follow them to the age of puberty and contrast their morbidity and mortality with their full term brothers.

If the premature infant survives the stormy two to three day period following the birth, his prognosis depends chiefly upon three factors: The weight at birth, the availability of sufficient quantities of woman's milk, and the success achieved in maintaining temperature equilibrium by whatever means available.

If sufficient breast milk is not available, the deficit may, in my experience, be most satisfactorily met with condensed milk. While it is true that condensed milk is a poorly balanced food, being low both in protein

¹ Archives of Pediatrics, April, 1921.

and fat, because of the high sugar-content and the fact that it is sterile, it may be most advantageously used for a period of a few weeks until the infant's digestive tract becomes tolerant to a better balanced ration with a higher vitamine content.

It may be a wise procedure to begin early the addition of $\frac{1}{2}$ dram of cod liver oil daily in divided doses to all premature infants. This amount may be increased as age advances. An infant born two months prematurely almost without exception eventually shows some manifestation of rickets. These manifestations occur in spite of the most careful feeding directed with the view of preventing rickets. With this in view, the early introduction of cod liver oil to the dietary of the premature infant would seem a sensible prophylactic measure.

Observations on the Capacity of the Stomach in the First Ten Days of Postnatal Life. Scammon and Doyle¹ have contributed an interesting analysis, from the Elliott Memorial Hospital of Minneapolis, on the capacity of the stomach in the first ten days of postnatal life. They took the records of the amounts of individual feedings, as determined by weighing before and after nursing, of 323 children, securing in all 14,571 individual records of physiological gastric capacity. The average physiological capacity of such infants as received feedings on the first day was 7 grams, for the second day 13 grams, for the third day 27 grams, for the fourth day 46 grams, increasing less rapidly until the tenth day when the average of 81 grams was obtained.

These authors state that the average gastric capacity increases with the body weight and that even on the first day of life there is a slight difference in favor of the groups of heavier children. The physiological capacity in first born and later children was apparently about the same. Regarding variability in average gastric capacity of all children, it was interesting to learn that the maximum capacity on the first day was 60 grams and 160 grams on the sixth day. It was also noted that the maximum meal of the day may occur at any of the five feeding periods which is contrary to our general belief that the baby always gets his largest meal at the first morning feeding. In their entire series of cases, there were 46 instances in which a meal was missed; in 18 cases the succeeding meal was smaller than the average, in 22 it was larger than the average, and in 6 cases it was the same as the average meal.

The average anatomical capacity in a series of 25 new-born children, ranging in birth weight from 200 to 4300 grams, was 33 cc.

It is instructive to read these useful facts so carefully prepared from a large series of cases. Most of us are inclined to overfeed new-born babies; it is no wonder that the artificially fed new-born infant vomits when he is occasionally offered three to four ounces at a feeding.

FEEDING.

Some Phases of the Pathology of Nutrition in Infancy. Marriot,² of St. Louis, has presented in a form which may well be considered a

¹ American Journal of Diseases of Children, December, 1920, No. 6, vol. 20.

² Ibid.

classic, a summary of his own work and a critical analysis of the work of others on two of the most important conditions occurring in diseases of infancy—intoxication and marasmus. Marriot aptly states that little information is obtained from the necropsy room as in the majority of instances the pathological findings on infants dead of disturbances of nutrition are essentially negative. He casts doubt on the opinions of Finkelstein and Meyer that most of the symptoms are referable to toxic substances of metabolic or bacterial origin.

He gives us an accurate clinical picture of the condition familiarly known to us as gastro-intestinal intoxication, the sharpened sunken eyes, the slate-gray, inelastic skin, the dry, parched lips of cherry-red color, the deep respirations which are often of the air-hunger type, the cold extremities in the presence of fever, the scanty, highly concentrated urine frequently containing albumin and a substance capable of reducing Fehling's solution. The blood is thick, is obtained with difficulty, does not flow freely, and, when centrifuged, shows scanty serum. He found in all marked cases a negative nitrogen and salt balance. As an explanation for the air-hunger occurring in these cases, he quotes his own work in conjunction with Howland in which it was demonstrated that acidosis was often present and was not the result of over-production of acetone bodies but possibly, in part, due to the failure of the kidney to excrete acid phosphate. They also demonstrated an increase in the inorganic phosphate content of the serum similar to the phosphate retention occurring in adult patients with uremic acidosis. Marriot ascribes the failure of renal function to water loss by way of the intestines, and quotes Schloss who confirmed these findings and found further evidence of renal impairment by demonstration of an excess of urea, and total non-protein nitrogen in the blood and reduced phenolsulphonephthalein excretion in the urine.

Marriot quotes the investigations of others who found that the blood of these infants is concentrated by water loss. There is an increase in the specific gravity, in the corpuscular volume and in the amount of dried residue. He mentions the important work of Starbug who found that with a colloidal osmotic pressure of the blood greater than the arterial pressure in the renal glomeruli, secretions of urine by the kidney ceases.

The author mentions that acidosis accompanying intoxication is in itself not usually the cause of death. He was able to benefit this by the use of sodium bicarbonate but usually the other symptoms remained unchanged or were made worse by this therapy and death resulted.

In contrasting wound shock with intoxication, the author observes that in the former there is a decrease of the amount of blood in currency due to leakage of plasma through the vessel walls and to the collection of blood in the periphery. The diminished blood-volume results in diminished volume flow of the blood. Thus, in a given portion of the body a diminished amount of blood flows in a unit of time. This results in an accumulation of acid products of metabolism in the tissues, and a decreased alkali reserve of the blood or acidosis.

The author attributes the gray color of the skin to stagnation of the

corpuscular elements in the capillaries from constriction of the arterioles. He attributes the failure of alkali therapy in acidosis to the fact that in isotonic or hypertonic solution it does not increase the blood volume or volume flow, nor does it lower the osmotic concentration of the blood and favorably effect the secretion of urine.

He compares the functional capacity of the gastro-intestinal tract in dehydrated infants with those of anhydremic dogs who were shown by Straub to be prone to the development of diarrhea and vomiting when fed.

Marriot relegates the previous conceptions regarding glycosuria to the background and explains it by accepting the findings of Araki in that glycosuria may occur in asphyxial conditions as a result of vasoconstriction, hemorrhage or a diminution of the oxygen-carrying capacity of the blood. This is presumably the result of increased glycogenolysis dependent upon acid production in the tissues. He compares the blood-volume in shock and intoxication and observes that in the former the diminution is due to loss of plasma, while in the latter there is actual drying up of the blood from water loss. In the former the protein concentration of the serum is normal or low, while in the latter it is distinctly high. There is present in both conditions a concentration of corpuscles in the capillaries; this stagnation possibly accounting for the gray pallor of the skin.

He explains the fever occurring in intoxication quoting Woodyatt and his collaborators who brought forward evidence that fever may occur as the result of a decreased amount of water in the body available for evaporation. They have demonstrated that the fever resulting from the administration of solutions of sugar or salts is dependent not upon the total amount of these substances given but upon the amount of water simultaneously introduced into the body. "Hypertonic solutions of unutilizable crystalloids leave the body, taking with them water. In the case of the injection of isotonic or hypertonic solutions, or when water is administered simultaneously to supply the water deficit, there is, according to these authors, no occurrence of fever."

He makes an interesting statement relating to the fact that infants of the type under consideration have a low water content and a high osmotic pressure of the blood, conditions leading to the occurrence of fever; that this fever is increased by the administration of hypertonic solutions of salts or sugars because it results in increased dehydration.

As an explanation of the more frequent incidence of intoxication in warm weather, he quotes Langstein and Meyer who found that an increase of from 20° to 36° C. may lead to a 600 per cent increase in water elimination by the skin and lungs. Such a loss in infants who have a lowered water reserve may readily lead to desiccation, with symptoms enumerated earlier in this abstract.

In summing up, he attributes the well-known clinical picture of infants who have become toxic following a severe diarrhea, to water-loss from the body, he believes that other causal factors are present but believes it unnecessary to assume the existence of other factors in order to explain the observed facts.

To establish the degree of desiccation in these infants, Marriot determined the index of refraction of the blood serum, the refractive index varying with the concentration of solids in solution. "As the protein has much greater effect on the index than the other solid constituents of the serum, it is possible, as shown by Reiss, to determine quite accurately the protein content of the serum by means of the refractometer." Using this method, the protein content of the serum of normal infants in the first six months of life averaged 6 per cent; toward the end of the first year up to 7 per cent. When the blood dries up as a result of water loss, the protein concentration naturally increases. Marriot observed an increase in the protein content of the serum as high as 50 per cent above the normal. With this refractometer method Marriot discovered a state of anhydremia in a number of conditions other than diarrhea, namely, in pneumonia, otitis media, and pyelitis.

Marriot mentions the fact that when an anhydremic individual is given food, even though diarrhea be absent, it is likely to result in diarrhea. It was shown by Straub, in his experiments on dogs, that anhydremic animals die sooner when food is administered than when completely starved; Straub's explanation being that the soluble metabolites accumulating in the blood still further increase its osmotic pressure and decrease the available water reserve.

The author makes the very striking statement that the water deficit in the infants with postdiarrheal anhydremia is approximately the same as the amount of weight lost. He finds that physiological sodium chloride solution given subcutaneously and in smaller quantities intravenously is frequently inefficient, but that the introduction of fluid into the peritoneal cavity is the most efficient therapeutic procedure at present available for the dehydrated infant.

The author finds that it is unnecessary to administer alkalies as a therapeutic measure in acidosis, unless the acidosis is of a severe grade. Sufficient water intake causes the acidosis to disappear, as the conditions which lead to its appearance are no longer present.

Marriot observes that in some of these infants the water loss has been so excessive that recovery is impossible. This he attributes to destruction of the body protein. In order to spare destruction of protein, he recommends the administration of a carbohydrate, such as glucose, intravenously, which temporarily increases the blood volume.

Toxic Symptoms in Infants and Children with Gastro-intestinal Manifestations. Schwarz and Kohn¹ have also described a group of cases with toxic symptoms. They also mention that Finkelstein's theory as to the alimentary origin of this condition has not been proven, nor have they noted in all their cases diminished carbon dioxide in the blood, which fact has been corroborated by Schloss and others. These authors mention that intoxication is relatively rare in children when the hygienic and living conditions are good, and that they have never seen it occur in the better class of private practice. These cases do, however, occur in infants who are well nourished and who have been well cared for. It

¹ American Journal of Diseases of Children, May, 1921, No. 5, vol. 21.

has probably been the good fortune of these authors thus far not to have encountered any in their private practice. In all the cases cited by Schwarz and Kohn, gastro-intestinal symptoms had occurred before the onset of toxic symptoms. They described the same group of symptoms as were mentioned in Marriot's paper and found as well that, in young infants, the iris changes from its characteristic light blue to a brownish-gray. Their physical examinations were uniformly negative; the liver was only moderately enlarged. It seemed to them that the quantity of urine excreted was often directly proportionate to the severity of the symptoms. The kidneys, in one case in which there was almost complete anuria, were examined histologically and found to be practically normal, although the liver was fatty and there was congestion of the gut.

In conclusion, these authors state, "The carbon dioxide content and the nitrogenous constituents of the blood may be normal. Some of these may show only diminished carbon dioxide content. Others show a normal carbon dioxide content, but a markedly increased retention of the nitrogenous constituents, and, finally, some cases show both a diminished carbon dioxide content and a nitrogenous retention. Therefore our studies would indicate that acidosis based on a lowered carbon dioxide content of the blood is not a constant or uniform finding. The sugar and cholesterol content of the blood may be normal or high. There is apparently no relation between these constituents and either the nitrogenous or the carbon dioxide content."

The group of symptoms described by these authors is most frequently encountered in hospital practice among infants who have been difficult problems for long periods, as a result of unskillful care and feeding, of infection, or of congenital feeble constitution. These symptoms do occur not infrequently, in infants who have been previously robust; sometimes in the summer during an attack of what promised to be a simple enteritis. They are also observed from time to time in previously well infants at any season of the year during an acute infection, such as pneumonia, otitis media, or pyuria. The treatment of such symptoms, in spite of our more recent knowledge of the etiology, is admitted by all observers to be most unfruitful. A mortality of 70 to 85 per cent in the severe hospital cases seems to be regularly admitted by those who have a wide experience. I shall not go into details with regard to therapy, but shall emphasize the importance of our only useful form of therapy; large quantities of fluids. If the infant will tolerate water by mouth in large quantities, the administration of fluids by this route alone is probably sufficient. Enteroclysis is not satisfactory in these conditions. The introduction of a catheter seems to increase the number of stools, probably because of increased peristalsis, little or none of the fluid is absorbed and harm rather than good is apt to result from this procedure. Whether clyses or intraperitoneal injections, or both, are indicated depends upon factors to be determined in the individual case. In my experience, the introduction of the largest quantities of fluid in the shortest unit of time compatible with absorption apparently gives the best results. In certain infants intraperitoneal injections are contra-indicated; those with pneumonia might have further embarrassment of

respiration therefrom, those with tympanites have aggravation of distention. The chief advantage in intraperitoneal injection lies in the fact that large quantities of fluid may be introduced into the body in a short period of time. An error in technic may be followed by serious consequences. As regards the introduction of alkalies intravenously in cases in which the symptoms supposedly due to acidosis predominate, there is divergence of opinion. I have seen many such cases recover, but whether it is due to the alkali or the large amounts of fluid is a matter of pure speculation.

In Schwarz's paper he has mentioned that in one case a fatty liver was discovered at autopsy. The role which the condition of the liver may play in the causation of symptoms of intoxication, is apparently not understood by investigators. To clinicians the size of the liver, as determined by palpation, is of great importance in prognosis. Those infants whose livers seem to enlarge from day to day, are the ones who, in my experience, end disastrously. That this increase in size is often due to fatty degeneration I have not infrequently noted at autopsy. As one notes the condition of some of these livers at autopsy, one does not wonder that they died but that they lived so long.

It is admitted that the treatment of intoxication is most unsatisfactory. Investigations along this line have been frequent in the past; many are under way. Let us hope that some definite therapeutic procedure will result which will be found as useful as the investigators lead us to believe.

Something definite may be done in a preventive way in combatting dehydration. In all infants this may be done by cultivating the habit in the parent of accustoming the infants to take a definite amount of water each day in excess of the water contained in the formula. At the onset of any acute infection or of intestinal disturbance, the parent should be directed to give the child a definite amount of water at frequent intervals. Infants with fever burn up large quantities of fluid and the replacement will have to be in amounts far in excess of their fluid intake prior to the onset of the fever.

Physicians are careless in this respect; they may direct that the infant have "plenty of water" without stating a specific amount. With some parents and also with many nurses "plenty of water" may mean 8 ounces daily while the fluid intake should be nearer 40 to 50 ounces.

The Nutritive Ratio of the Infant's Ration. Zahorsky,¹ of St. Louis, advocates the use of the term nutritive ratio to express the relative quantity of protein in the infant's diet. The nutritive ratio expresses the ratio of the nitrogenous to the non-nitrogenous elements in the food. He mentions that it is usually calculated by the following proportion: Percentage protein: percentage carbohydrate + $2\frac{1}{4}$ percentage fat :: 1 : x. Thus if the infant is fed a mixture containing 1.5 per cent protein, 2 per cent fat, and 7 per cent sugar, the proportion would be $1.5 : 7 + 4.5 :: 1 : x$. The nutritive ratio equals 1 : 7.6.

He notes that the nutritive ratio of woman's milk is 1 to 13 but

¹ Archives of Pediatrics, May, 1921, No. 5, vol. 38.

believes that the infant taking artificial food needs a diet whose nutritive ratio is at least 1 to 8.

He makes much the same statement as Holt that the protein of woman's milk can be completely utilized by the baby while heterologous protein is assimilated only after a large part of the nitrogenous substance is wasted. Zahorsky thinks that infants thrive best when the nutritive ratio is 1 to 6 corresponding to the common mixture of $\frac{2}{3}$ milk and $\frac{1}{3}$ water with 4 per cent carbohydrates added.

He attributes some of the failures in top milk feeding not to the fat but to the lowered nutritive ratio, which commonly varies from 1 to 9 to 1 to 16. Barley water and buttermilk, equal parts, with 5 per cent cane sugar gives a nutritive ratio of 1 to 5. Protein milk has a N. R. of 1 to 2.5. Zahorsky states that in Nestle's food the N. R. is 1 to 6 and in malted milk 1 to 5. In calculating the nutritive ratio of many of the proprietary foods one would find many with a suitable ratio but which would be extremely unsuitable for prolonged food because of their low fat content.

The nutritive ratio is most useful as a check in infant feeding but like the estimation of calories it cannot be depended upon as a guide.

The Protein Requirements of Children. Holt¹ emphasizes that the total protein requirement of children is to a large extent dependent on the character of the protein given. He comments on the fact that proteins differ in their amino-acid content; that vegetable proteins are low in amino-acids essential for growth, while animal proteins are far richer in these substances, corresponding more closely in composition to the body proteins.

He observes that among adults proteins are required for repair only, while in children they are necessary both for growth and repair. Holt does not believe that vegetable proteins are sufficient for growth.

The protein furnished the nursing infant varied from 8 to 12 grams daily up to nine months of age, this being the equivalent of $1\frac{1}{2}$ grams per kilo. The reason why this small amount was sufficient for both growth and maintenance lay in the high amino-acid content of the protein of woman's milk. As cow's milk is deficient in some of the important amino-acids especially cystin, it is necessary to give double or triple the protein contained in woman's milk to supply the needs of the growing infant.

Holt showed that among 100 healthy children on their customary diet at one year each took 40 grams of protein daily, at six years 60 grams, at twelve years 80 grams daily, and at sixteen 115 grams a day.

In writing a formula for a growing infant, most of us have acquired the habit of determining the percent of fat and carbohydrate suited to fulfil the caloric needs of the infant and have allowed the protein content of the mixture to take care of itself.

As Holt has stated it is the low protein content of condensed milk which makes it particularly unsuitable as a food for long periods. The same criticism holds good for some of the proprietary foods and the

¹ Abstract, Archives of Pediatrics, July, 1921, No. 7, vol. 38.

dried milks. It is to be hoped that this timely warning from such an eminent authority will put us on our guard when we are directing the feeding of infants.

The Employment of the Czerny and Kleinschmidt Butter-flour Mixture. Griffith,¹ of Philadelphia, believes that a milk preparation suited to infants should contain the relative proportions of fat, protein and carbohydrates, which exist in woman's milk and that the high protein content of many formulæ might be extremely harmful. He advocates the use of the Czerny-Kleinschmidt mixture and emphasizes the desirability of having the ratio of carbohydrate and fat a fixed one. The good results obtained, he suggests, may be due to the fact that in the preparation of this mixture the volatile fatty acids are driven off, in part to the admixture of an amount of flour equalling that of the fat, in part to the chemical alteration of the flour by browning, and in part to the low protein percentage which he believes is of great importance in weakly infants.

The proportions recommended by Czerny and Kleinschmidt consisted of 7 grams of butter, 7 grams of flour, 5 grams of sugar, and 100 grams of water to be mixed with amounts of milk suitable to the individual case. The butter is melted over a slow fire and the volatile fatty acids driven off, the wheat flour is then added, the whole boiled and rubbed through a sieve and afterward added to boiled milk.

Griffith reports feeding 40 children of one to six years of age with this mixture, most of whom did well. This mixture is high in fat and carbohydrate but very low in protein. Holt, who discussed the paper, justly criticized the formula because of the low protein. A food with such a low protein content might be useful for short periods but would not contain sufficient protein for growth needs.

Concentrated Food for Infants. Helmreich and Schick,² in a communication relative to the use of concentrated foods in the treatment of various conditions in infancy, relates that they noted no adverse symptoms when the food was so concentrated that only one-half of the customary fluid intake was given. They rather infer that we have arbitrarily selected a daily fluid intake which is unnecessarily high and perhaps superfluous. Figures defining the amount of fluid an infant should take at various ages are based on the amount of fluid the average breast-fed infant receives from his wet nurse. It would seem that such figures are likely to resemble his requirements. Up to the fifth month at least it is safe to assume in most instances that three times the weight in pounds approximates in ounces the infants twenty-four hour fluid requirement.

I have treated many infants with thick, concentrated mixtures but have always had their fluid requirements taken care of with a liberal supply of water between feedings. I believe they do better when the fluid intake is liberal. The infants are more likely to be satisfied and in consequence cry less, the stools are less constipated, and the urine, which is less concentrated, does not irritate the buttocks.

¹ Abstract, Archives of Pediatrics, July, 1921, No. 7, vol. 38.

² Zeitschrift für Kinderheilkunde, September 5, 1921, No. 3-4, vol. 30.

I have observed one of these infants who constantly had a temperature when the fluid intake was very low. When extra fluid was given to bring the total intake up to normal the fever subsided. Although this isolated instance proves nothing, the condition may be analogous to the inanition fever of the new-born, which is also probably due to water loss.

Vitamines and Nutrition. Lewi and Dubin¹ give an excellent summary on the more recent conceptions regarding vitamins. They themselves are endeavoring to identify the substance in yeast which Funk, in 1911, obtained from both yeast and rice polishings, capable of curing and preventing beriberi. They are also endeavoring to isolate the active principal of cod-liver oil.

Hopkins, who has recently lectured in this country, was greatly surprised at the universal enthusiasm with which articles on vitamins, both scientific and popular, were received by all classes of the laity. It has been related to me that he told one acquaintance he thought the country had gone crazy on vitamins. If one of the pioneers has that opinion it would seem that it is time we took stock and got down to earth.

Lewi and Dubin quote from Funk's book, "The Vitamines," written in 1913, in which he classified the vitamins as follows:

1. Antirachitic vitamin called Vitamin A, found in certain oils, fats, and in the leafy parts of some vegetables.
2. Antiberiberi vitamin, called Vitamin B, occurring in a variety of grains, vegetables, and animal products and in yeast.
3. Antiscorbutic vitamin, called Vitamin C, distributed in certain fruits and vegetables.

Many pediatricists, myself included, begin the administration of orange juice in early infancy, giving increasing amounts as age advances. Small doses of cod-liver oil are generally well tolerated by infants. In infants with a rachitic tendency it should certainly be administered and might be given with benefit to many other infants as a prophylactic measure.

The early administration of green vegetables to infants, in my experience, is a wise procedure. In the past we have attributed the resulting better color and musculature to the salt and iron content of these vegetables, but our more recent knowledge inclines us to believe that perhaps the vitamin content of spinach leaves may be quite as important a factor.

It is decidedly unwise to expect too much of the vitamin element in certain foods and thus lose sight of the necessity to the growing child of the well balanced ration.

RICKETS AND SCURVY.

Calcium and Phosphorus in the Serum in Relation to Rickets. Howland and Kramer² have made a valuable contribution to our knowledge of

¹ New York State Journal of Medicine, July, 1921, No. 7, vol. 21.

² American Journal of Diseases of Children, August, 1921, No. 2, vol. 22.

rickets. They have demonstrated that during the period of active rickets, the calcium concentration may be normal or slightly reduced, the reduction seemingly not being dependent directly upon the rickets. They feel that in many instances the reduction in the calcium content of the serum is associated with a latent form of tetany. They also discovered that the inorganic phosphorus of the serum is regularly reduced in active rickets, sometimes to an extreme degree. During the healing process in rickets, the phosphorus-content of the serum gradually rises to a normal content.

Among 2000 determinations of the calcium content of the serum, they found that in health it is singularly constant. In tetany and nephritis there was a striking diminution in the calcium content. In normal children the content was 10 to 11 mg. per 100 cc which is slightly higher than if normal adults.

These authors quote from their previous article¹ wherein it was stated that while there was a moderate reduction of calcium in the majority of cases of rickets studied, there was a normal calcium content in at least one-third of the cases of active rickets.

It is of interest to learn that the great majority of these authors' determinations were made in the winter and spring months when the spontaneous cure of rickets is unlikely to occur. Even in some of their severe cases the calcium content of the serum was normal.

Their findings regarding phosphorus are much more striking and in consequence more interesting.

In all their patients in the active stage of rickets, the concentration of inorganic phosphorus in the serum was low. With the healing of the rachitic process in the bones, the phosphorus rose gradually to normal. These facts led Howland and Kramer to consider the presence of a low inorganic phosphorus in the serum of a young child as nearly conclusive evidence of active rickets. To quote them exactly, "In rickets we believe, therefore, that there is constantly a marked and, for the causation of the pathological lesion, an important deficiency in inorganic phosphorus. To this deficiency is to be ascribed the failure of calcium deposition." They visualize the process of calcification as follows: "There filters from the arterial capillaries into the intercellular matrix of the cartilage and about the trabeculae a fluid containing calcium and phosphate and bicarbonate in the same concentration as in the serum but with much less protein. A slight reduction in carbon dioxide tension, operative, perhaps, for a short period of time, would result in the precipitation of calcium salts in inverse proportion to their solubility. It seems likely that the reduction of carbon dioxide tension is favored by the extreme metabolic inactivity of bone and cartilage."

All the children under two and a half years of age in whom it was found an inorganic phosphorus content of the serum of 3.0 mg. or less, were in the active stage of rickets.

These findings of Howland and Kramer add a fund of information to our knowledge of rickets. Work still remains to be done in connection

¹ Howland and Marriot, *Quarterly Journal of Medicine*, 1918, **11**, 289.

with solving some of the etiological factors. Let us hope that opportunity will be permitted these investigators to finish the work. When one reads the results of a laborious achievement of this character, one becomes more sympathetic with the idea of the "Full Time" Professor.

A. W. Pappenheimer,¹ who has been engaged during the last eighteen months on a study of rickets, has had similar findings, thus confirming the results of Howland and Kramer as to the low inorganic phosphorus content of the serum in rickets.

The Cure of Infantile Rickets by Sunlight. Hess and Unger² report definite improvement in rachitic manifestations upon exposure to direct action of the sun's rays. They state the following: "The babies which we cured by means of the sun's rays were on regular dietaries, such as whole milk and cereal, or dried milk, cereal, and orange juice. This diet was not altered during the course of the treatment." Hess and Unger believe that the actinic rays are the dominant factor in the seasonal incidence of rickets and an important bearing on the geographical distribution of rickets.

Clinicians are generally agreed that there are a number of etiological factors concerned in the production of rickets. The high incidence of rickets in the Italian emigrant from southern Italy, seen so frequently in New York City, is the cause of much discussion. An Italian woman will rear several non-rachitic children entirely on the breast. She will then emigrate, have another child in New York, also breast-fed, who will show severe manifestations of rickets.

The woman and her children have lived in Italy almost entirely in the open air. Upon arriving here, for economic reasons they are forced to live in crowded tenements with access to fresh air and sunlight made extremely difficult. Unaccustomed to cold weather in the winter months, the mother lives entirely indoors before the birth of the child. After her delivery, both she and her infant are indoors too much unless the accouchment occurs in the months of good weather. In Italy, the diet of the Italian peasant consists chiefly of cereals, with a liberal supply of fresh fruits, eggs, olives, and vegetables, most of the food being cooked in olive oil. The diet taken in New York is somewhat of the same character, but the intake of fresh fruits, vegetables, and eggs is curtailed by the expense of such articles of food.

Why does the Italian child born in New York and breast-fed develop rickets when the other children born abroad escape?

Is it due to a fault in the diet of the pregnant mother, producing a disposition to rickets in the infant, or does it operate through a lack of antirachitic vitamine in her milk? Are these the chief factors in the production of rickets in this class of infants or is it due to the lack of sunlight and fresh air?

Clinicians not infrequently note that the children of some families, in spite of every dietetic and hygienic precaution, develop mild manifestations of rickets.

May there not be a familial as well as a racial predisposition to

¹ Address, Bellevue Medical Society, November 2, 1921.

² Journal of the American Medical Association, July 2, 1921, No. 1, vol. 77.

rickets? Given the same diet and the same living conditions, I have heard that in some of our southern states the incidence of rickets in the negro child is higher than in the white American. All this is far afield from the sun treatment of rickets, but until we can group and correlate all the known etiological factors concerning rickets; the question of therapy will have to be many-sided.

In support of Hess and Unger's theory as to the effect of sunlight, many have noted the tendency toward the spontaneous recovery of rickets during the summer months.

Diet as a Factor in the Cause of Rickets. Findlay,¹ of Glasgow, attacks the vitamine theory as a causal factor in rickets and presents some interesting testimony to support his arguments. He blames Bland-Sutton's well-known experiments on lion cubs for the prevailing opinion that diet is the chief offender, and infers that Bland-Sutton himself has recanted and now holds the opinion that a gastro-intestinal disturbance, probably of a microbic nature, is the initial cause of the disease. Findlay recalls our previous conception that rickets was caused by a calcium-poor diet and reminds us that this conception was only overthrown with the increase in our knowledge regarding the histology of the disease when it became apparent that rickets was not produced by this type of diet, that it was an osteoporosis which did not simulate true rickets. He makes the important statement that Mellanby and his co-workers no longer feel certain that rickets is due to the absence of an accessory food factor associated with fat and meat extracts and formerly thought by them to be identical with fat-soluble A.

Findlay makes an amusing comment regarding Hopkin's statement that he "acquired a bias in favor of a dietetic factor by observing the disease in Venice where it seemed so frequent in families which, so far as one could discover, never even saw dairy products of any kind." He states, "It is perhaps fortunate that Hopkin's travels did not take him to the West Coast of Africa, where dairy products are probably more rare and rickets unknown, or much of the interesting work emanating from Cambridge might have been denied us."

Findlay himself is strongly of the opinion that the cause of rickets is lack of exercise and confinement. He selected two groups of cases for observation. One group was admitted to a hospital where careful diet and cod-liver oil and phosphorus was instituted. The other group was treated in the out-patient department by means of massage and electricity. In the out patient group no directions as to diet were given and no cod-liver oil was administered.

He presents brief outlines of 8 cases, 4 of each group. He himself is obviously impressed with the result of these observations but there is nothing contained therein which, from my viewpoint, would induce me to omit the customary therapeutic procedures in favor of massage and electricity.

Bone Changes after Scurvy. Frank,² in following up a number of cured cases of scurvy, found that in 61 per cent of a small group ranging

¹ Archives of Pediatrics, March, 1921, No. 3, vol. 38.

² Zeitschrift für Kinderheilkunde 1920, Nos. 3-4, vol. 27.

from seven to twelve months of age, that on examination as long as seventeen months later the bones still showed the effects of the disease. This brings up an interesting question regarding which I have had no experience. Frank states that nearly all her cases were rachitic. This makes one wonder whether some of the after effects noted were not due to rickets, rather than scurvy.

THE BLOOD.

Physiology of the Blood in Infancy and Childhood. Lucas,¹ of San Francisco, has written a résumé of the newer findings and conceptions regarding the physiology of the blood in infants and children. Some of the more recent knowledge is doubtless familiar to many of us. Some of us cling to old conceptions relating to the physiology of the blood in spite of the newer knowledge, perhaps because tradition has us in a firmer grip than science. For all of us a greater part of this résumé is quoted verbatim, without comment, with the belief that the weakest spot in the practitioner's make up is his knowledge of physiology.

Lucas states that modern methods of physiology and biochemistry have altered our conception of the value of blood studies in the understanding of anemias as well as other diseases. Kidney function can be determined more accurately by blood examination than by urine examination.

"DESTRUCTION OF RED BLOOD CELLS. The morphological study of blood furnishes very valuable data as to the condition of the blood-forming organs. Normally, the blood level is kept up by daily destruction and replacement of cells. It has been estimated that from $\frac{1}{10}$ to $\frac{1}{15}$ of all red blood cells are daily destroyed, as estimated by the daily excretion of this amount of hemoglobin-derived pigment. However, Ashby has recently determined, by estimating the disappearance of cells transfused by the differential agglutination test, that the normal life of the red blood cell is about thirty days. Destruction is continually carried on by the following processes:

"1. By phagocytosis. The endothelial cells in the spleen, liver, and other organs take part in the process.

"2. By fragmentation. This is shown by the occurrence of microcytes and poikilocytes. Fragmentation is produced in the circulation and not in the bone marrow. Normally, there are a few such cells always present in the circulation, but under pathological conditions, when young cells are thrown out in large numbers, these young cells cannot stand the functional strain put on them and become easily fragmented. Under pathological conditions, not only fragmenting cells but also cells with vacuoles may be found. These finally become hemoglobin dust. They are removed from the circulation and appear in the spleen. Such hemoglobin dust is found in the normal spleen, but it is found in much larger quantities in anemic conditions.

"3. By hemolysis. Under normal conditions this probably plays

¹ Journal of the American Medical Association, July 30, 1921, No. 5, vol. 77.

very little part, as hemolysis is normally an intracellular process; but in pathological conditions it may play a big part. Under such conditions hemoglobinuria occurs, often accompanied by fever and chills.

"4. The increased fragility of the red blood cells. This is especially found in certain pathological conditions, such as congenital hemolytic icterus, in which there is pronounced blood destruction.

"REGENERATION. Processes of regeneration are also continually going on. Normally, the bone marrow produces only enough red blood cells to maintain the daily loss of red blood cells in the normal wear and tear of life. Bone-marrow activity is limited only by its functional capacity. This may be hyperstimulated under certain conditions, as by a diminished oxygen supply, such as that found in high altitudes, or where there is difficulty in the absorption of oxygen through the lungs, as in congenital cardiac conditions. Whether this changes the blood reaction toward the acid side, which in turn stimulates the bone marrow, is not clear, and whether the products of red blood cell destruction, that is hemoglobin, stimulates the bone marrow, is not certain. With the destruction of the red blood cells there is an increase in the complement-like substances; but what part these play in the stimulation has not been decided.

"Bone-marrow activity is normally a balanced process between blood destruction and blood regeneration. Certain tests can be carried out to determine how this balance stands out at a given time. 1. Urobilin estimations in the urine and stools can be used to estimate the presence or the extent of blood destruction. 2. By means of vital staining, such cells as the Howell-Jolly bodies, Cabot's ring and stippling can be made out. These may give some idea of the effort which the bone marrow is making in the production of blood and in its effort to maintain the optimum level. 3. Such an estimate of the effort which the blood-forming organs are making may better be done perhaps by estimating the number of (a) reticulated cells, (b) platelets, and (c) mitochondria, all of which can be determined by special staining methods. These are signs of bone-marrow stimulation. Normally, reticulation exists in from 0.5 to 2 per cent of the red blood cells. With marked bone-marrow activity this percentage is increased. In simple anemia it usually does not go higher than 4 or 5 per cent. In hemorrhagic jaundice, one finds reticulated cells as high as from 15 to 20 per cent, and after hemorrhage this may be even higher, from 20 to 30 per cent. The percentage of reticulation is therefore of great diagnostic value, taken in conjunction with the general condition of the patient. As the reticulated cells diminish after hemorrhage, it can be considered as a good prognostic point. The estimation of platelets also gives us an idea of the activity of the bone marrow. They are increased where there is marked activity and decreased where there is defective regeneration. In diseased conditions where they have been reduced, their return to normal may be a favorable sign.

"Mitochondria are small lipid bodies found within the cell protoplasm, which can be demonstrated by some of the newer stains. They are not found in adult or fully formed red blood cells, but are found in nucleated

red or immature red blood cells; therefore their presence and estimation give us some idea of the number of the immature cells in circulation.

"It has been shown that oxygen consumption may be proportional to the percentage of reticulated cells. Normally, human red cells consume very little oxygen. In anemia, the consumption of oxygen by the red blood cells may be marked; and this depends on the presence of young cells, not that of the full grown erythroblasts. The demonstration of an increased oxygen absorption by accurate methods may prove a more quantitative index of functional variations in bone-marrow activity than the microscopical evidence taken alone.

"It has been pointed out that there is a certain diurnal change in the amount of hemoglobin in circulation which normally is about 10 per cent, but under pathological conditions may be as high as 30 per cent. The highest hemoglobin estimations are between nine and ten in the morning, and the lowest between six and seven in the evening. These variations must be considered in connection with the change that is taking place in the blood and circulation, in the pulse-rate, and rate and volume of absorption, and possibly with the fluid absorption or kidney excretion.

"In any study of the regeneration of hemoglobin and red blood cells it is important that the determination of hemoglobin percentage be as accurate as possible. Various investigations with the ordinary methods of testing hemoglobin have shown that they give an error of from 5 to 20 per cent. The newer methods of estimating hemoglobin are based on the oxygen capacity of the red blood cells. Various methods for estimating the oxygen capacity have been worked out by van Slyke and Hoppe-Seyler, and lately Palmer has published a method which is the most accurate one we have for determining hemoglobin percentage and oxygen capacity of the hemoglobin. Robscheit has modified this somewhat and determines the hemoglobin in the form of acid hematin. Some such method as that of Palmer or Robscheit should be adopted for all clinical purposes for the determination of the hemoglobin, as accurate estimates are much to be desired in the study of blood regeneration and destruction.

"**FUNCTION OF THE SPLEEN.** The function of the spleen in regard to regeneration and destruction of blood has been under much discussion. The facts regarding the position of the spleen in regeneration are as follows: It is known that during fetal life the spleen has the function of forming red blood cells and that under pathological conditions the spleen may take on this function, especially in the production of myeloid cells. There has been much discussion as to whether the removal of the spleen in certain blood conditions is of value because it affects blood destruction or because it affects the formation of blood. Usually there is an anemia following splenectomy. This may be due to a diminished activity of the blood-forming organs. This is borne out by the fact that after splenectomy there is less rapid blood regeneration in the splenectomized animal. The spleen probably affects the activity of the bone marrow, normally exerting a stimulating effect. It has been shown that after splenectomy the bone marrow increases to take over the function of storing and elaborating the iron of the old blood pigment. There are

certain facts, however, which point to the spleen as taking part in blood destruction. After splenectomy, red blood cells show increased resistance to various lytic agents, hypotonic salt solution, and the mechanical effects of shaking. The spleen probably has to do with the normal destruction of worn-out red blood cells. However, it must be remembered that the removal of a normal and of a pathological spleen may differ in what they demonstrate. In a pathological spleen the removal may cause hemolysis and depress the bone-marrow function, whereas splenectomy of a normal spleen causes anemia by taking away the normal stimulus to blood formation. Furthermore, it must be remembered that the spleen is only one organ among many which have to do with blood formation, and also that these organs, the liver, lymph nodes, bone marrow and spleen, all have interrelations which are important.

"COAGULATION. Coagulation may be defined as the colloidal change which occurs under the influence of calcium electrolytes, during which the blood is transformed from the fluid state into the solidified state, which we recognize as coagulated blood. The changes which take place during this process are now more clearly understood, because the various factors which enter into them have been made capable of separate analysis. Coagulation of normal blood may be divided into three stages. Of the first stage very little is known except that certain definite changes take place during a very short period of time. The second stage, which is the formation of thrombin, depends on the reaction between two substances, cytozyme and serozyme, the one obtained from the cellular elements, and the other from the plasma, acting in the presence of calcium salts to form thrombin, which, in turn, during the third stage, combines with fibrinogen to form the fibrin clot. It can now be clearly demonstrated that the factor fibrinogen is disturbed in conditions primarily affecting the liver. Calcium itself is rarely affected except in those cases in which there is a sufficient quantity of bile salts in circulation to combine with the calcium salts, thus rendering them unavailable for combination with the serozyme and cytozyme.

"The factor concerning which we know the most is that derived from the cells, particularly the platelets. There are two main conditions in which there is marked disturbance of this factor. In purpura hemorrhagica there is a deficiency in the number of platelets. When the platelet count falls below 100,000 we are in the danger limit; when it falls below 20,000, hemorrhage from lack of platelets will occur. In hemophilia, and in the ordinary case of hemorrhage of the new-born, there is a qualitative change in the platelets or their product, prothrombin. The total number of platelets may not be diminished, though qualitatively they may be so changed that hemorrhage may occur at any time. In hemorrhage of the new-born this is a temporary condition, which usually passes away within a very short time. We have been able to show from experimental work on the blood of the new-born that there is, during the first few days of life, a definite qualitative defect or, perhaps better, a lack of equilibrium in the prothrombin elements. In hemophilia, the condition is hereditary and constantly present, whether there is bleeding or not. There are certain other types of hemorrhage

of the new-born, such as that which occurs during acute septic infection of the new-born, in which the antithrombin, which Howell has demonstrated, is the main factor at fault; and there are certain other cases of liver injury, as demonstrated by Whipple, in which the fibrinogen is at fault; but the usual cases of hemorrhage of the new-born, and certainly those which respond to blood transfusions, are those in which the prothrombin element is affected. Just what is the underlying cause of this lack of balance in the prothrombin element in the new-born has not yet been demonstrated.

"The fact that the life of the blood platelet is approximately only four days, which is a very much shorter period than that of the other cellular elements of the blood, explains the reason why the value of transfusion in hemophiliac conditions is so short-lived. As soon as the transfused platelets disappear, the primary condition returns. Some permanent effect on the prothrombin element has been obtained by feeding cephalin or thromboplastic substances to hemophiliacs. This line of treatment we feel offers the best permanent results in the treatment of true hemophiliac conditions; whereas direct transfusion in the temporary disturbance of prothrombin in the new-born successfully cures this condition, as the prothrombin factor reaches its normal level probably by the end of the first week. This explains very clearly the success which transfusions have given in these cases of hemorrhage of the new-born.

"**THE TIME ELEMENT.** It is important to determine the coagulation time by proper methods. The ordinary methods of determining coagulation time by obtaining the blood from puncture wounds is open to grave objections. Unless the blood is derived directly from the vein, tissue juices are mixed with the blood, and so definitely affect the coagulation time that a true picture is not obtained. If the blood is drawn from a vein under proper conditions and tested, the normal coagulation time averages from six to twelve minutes; anything over twenty minutes can be taken as meaning definitely delayed coagulation.

"A further simple test is that of bleeding-time, which is estimated by making a fresh cut in the finger or lobe of the ear so that the blood flows drop by drop. The blood is taken up on absorbent paper at intervals of thirty seconds. In this way, each drop will give the amount of blood shed in the given interval. The total duration from such a bleeding point will be the bleeding-time. Normally, bleeding-time varies from one to three minutes and is independent of the coagulation time. For example, in purpura hemorrhagica the coagulation-time is usually normal but the bleeding-time markedly prolonged, whereas in hemophiliac conditions the bleeding-time may be normal but the coagulation-time is markedly prolonged."

Hemorrhagic Purpuras. In connection with hemorrhagic purpuras, Mouzon¹ emphasizes the importance of abnormal conditions in the blood platelets as the cause of the large group of true hemorrhagic purpuras; that is, those in which the blood clot does not retract although the coagulating-time may be normal. He quotes Hayem who called atten-

¹ La Presse Médicale, Paris, September 10, 1921, No. 73, vol. 29; Abs. Journal of the American Medical Association, No. 20, vol. 77.

tion to the protracted bleeding-time and great reduction in the number of platelets. Others have published results of research on the pathology of the platelets which have demonstrated essential thrombopenia and thrombocasthenia and the cure of the hemorrhagic diathesis in a case of essential thrombopenia by splenectomy. He reminds us that in purpura the walls of the vessel may be at fault, as in slow endocarditis; in another the coagulating ferments are lacking, as in sporadic hemophilia: in others, as scurvy, nothing can be demonstrated to explain the hemorrhagic tendency.

It would seem that recently there has been a renewed interest in the blood platelets. During my term of hospital service we looked upon the blood platelets as a basic staining body presented in normal blood. We had no interest in their presence, we knew little of their significance and, naturally, they were never counted. Today when transfusions have become an every day procedure and platelet counts almost a routine we are learning something of their significance.

It may be worth while to recall that the average platelet count in adults is between two and four hundred thousand and may be slightly higher in children. These bodies are related to blood clotting and when the count falls below fifty thousand there is a marked tendency toward bleeding, although the coagulation-time may remain normal. The count is high after severe hemorrhage. As stated by Lucas, the extra platelets furnished in transfused blood last only a few days. The technic of enumeration as outlined by Wood¹ is as follows: The blood is mixed with the diluting fluid in the proportion of 1 to 100 in an ordinary red cell pipette and counted in an ordinary counting chamber. A very thin cover-glass should be used. The diluting fluid consists of 3 parts of a 1 to 300 aqueous solution of brilliant cresyl blue and 3 parts of a 1 to 1400 aqueous solution of potassium cyanide. The mixture should be made up and filtered just before the blood is drawn. After the counting chamber has been filled, ten minutes should be allowed for the blood platelets to settle. They appear as sharply outlined lilac-colored bodies; the red cells are decolorized; and the nuclei of the white cells are stained a dark blue. The cresyl blue solution is permanent, but should be kept on ice. The cyanide solution must be made up at least every ten days.

THE SPLEEN.

Indications for Removal of the Spleen in Infants and Children Bartlett,² in a paper read before the American Pediatric Society on indications for removal of the spleen in infants and children, expressed some valuable criteria which should receive the careful consideration of any who have under medical care a child with an enlarged spleen. He stated that hemolytic jaundice, Gaucher's disease, Banti's disease and von Jaksch's anemia were four names given to pathological processes for the relief and cure of which removal of the spleen might be the only treatment. He believes that it is impossible to establish the identity of von Jaksch's

¹ Chemical and Microscopical Diagnosis; D. Appleton & Co., 1918.

² Abstract, Archives of Pediatrics, July, 1921, No. 7, vol. 38.

or Banti's disease in their early stages, just when splenectomy was of the greatest value. In certain symptom-complexes in which anemia and a large spleen were the prominent manifestations, it was essential to have certain criteria for splenectomy. He believes that the combination of a persistent blood destruction and of an enlarged spleen in spite of repeated transfusions and failure of radium to reduce the size of the spleen furnished a good starting point for serious consideration of splenectomy. It was well to make a thorough search for evidence of blood regeneration as well as of blood destruction when one was confronted with the problem of splenectomy.

The mistake that most of us make when confronted with the question of treatment in these cases is in our endeavor to attach a particular name to the disease with the symptom-complex in which anemia and a large spleen are the essential manifestations. The indications for splenectomy have nothing to do with the name of the disease, yet some men still persist in telling us that they will remove a spleen in case of Banti's disease, but in the so-called von Jaksch's disease they prefer to wait. If the combination as described by Bartlett is present, splenectomy should receive serious consideration and the question of labelling the disease may be settled afterward in the laboratory.

Splenectomy in Splenic Anemia and Banti's Disease. Mayo¹ has made some observations on splenectomy which have an especial interest for those treating diseases of children. Not infrequently one is confronted with the question of splenectomy in a variety of blood conditions in which a large spleen is present. Especially is this true when the child gives a history of repeated hemorrhages, the frequency of which are not modified by transfusion. Another type, which is not uncommon, is the one with a large spleen and a blood picture resembling secondary anemia. Another presents the familiar picture of von Jaksch's disease which, as Mayo states, does not always improve under such treatment as heliotherapy, change of diet, and transfusion.

Mayo mentions that splenic anemia is characterized by an enlarged adherent spleen, a secondary type of anemia, and a leukopenia, while pathologically the spleen shows generalized fibrosis and thrombophlebitis with atrophy of the pulp cells. He voices the views of other observers that Banti's disease is merely a late stage of splenic anemia, presuming that the etiological agents which are removed by the spleen from the blood stream, affect not only the spleen but also the liver terminally. He expresses the opinion that the type of cirrhosis produced is portal, showing that the cause of the disturbance is carried to the liver through the portal vein.

Mayo states that hemorrhage from the stomach is not always relieved by splenectomy, but is greatly reduced in frequency.

Among 249 spleens removed of all ages at the Mayo Clinic with a mortality of only 10 per cent, 71 were for splenic anemia of unknown origin with a mortality of 12.6 per cent. In 8 cases of von Jaksch's anemia, splenectomy was performed without an operative death.

¹ Journal of the American Medical Association, July 2, 1921, No. 1, vol. 77.

Although the question of splenectomy should not be approached without the closest observation of the child for a considerable period of time, it probably offers the best chance for recovery in a certain percentage of the cases. Pediatricists are prone to wait too long before considering surgical intervention in cases of enlargement of the spleen.

Splenectomy in Hemolytic Jaundice. Pennato¹ reports a case of splenectomy in congenital hemolytic jaundice in which there was a striking improvement directly after operation. A supernumary spleen showed the same advanced fibrous degeneration as the spleen proper. He refers to Michilis case and also Losio's case in which the recurrence later was attributed to the supernumerary spleen which had been left behind at their operations. We have had recently under our care at the hospital a boy aged nine years with congenital hemolytic jaundice. Except for a moderate degree of malnutrition, a marked jaundice and a large hard tumor mass occupying half of his abdominal cavity, he presented the usual picture of boys of his age. He attended school, and, except for fatigue on exertion which curtailed his play, he led a normal life. Within twenty-four hours following splenectomy, the jaundice had entirely disappeared. The spleen weighed over 2 pounds. It was easy to understand why this boy was fatigued upon moderate exertion when one saw the size of the tumor mass he was carrying about in his abdominal cavity.

Congenital Hemolytic Jaundice. Sauer² reports the removal of the spleen in 5 cases of congenital hemolytic jaundice, 3 of which were in children of nine, eleven, and sixteen years of age respectively. In 4 of the 5 cases the disease was inherited. All the patients showed remarkable improvement after the operation. In 3 of the cases the cure was complete when observed seven years after splenectomy, but as an abnormally low resistance of the red blood cells to hypotonic salt solution persists, he thinks the spleen cannot be held accountable for the whole process. Sauer is of the opinion that there is an anomaly of the red cells themselves.

TRANSFUSION.

Blood Transfusions in Children, Analysis of Six Hundred Cases. Brown,³ of Toronto, and his co-workers, have presented their observation on blood transfusion in children from an analysis of 600 cases.

Insofar as compatibility is concerned, they found that in newborn infants the father and mother were in the same group as the child in 56 per cent and 57 per cent respectively of those tested. In only 25 per cent of the tests were both parents in the same group as the child. They preferred the syringe cannula method to all others, except in selected cases where the citrate method was used. The internal saphenous vein at the ankle was the site of election for transfusion. They believed that the maximum amount to be transfused in children up to

¹ *Reforma Medica* Naples, May 14, 1921, No. 20, vol. 37; Abs., *Journal of the American Medical Association*, No. 26, vol. 76.

² *Mitt. a. d. Grenzgeb. d. Med. u. Chir.*, 1920, No. 5, vol. 32.

³ *Northwest Medicine*, Seattle, September, 1921, No. 9, vol. 20.

eighteen months of age should not exceed 15 cc per pound of body weight. In nutritional cases the only benefit derived was noted in severe decomposition associated with secondary anemia and acute intestinal intoxications. Their most striking results were obtained in hemorrhagic diseases, but in uncomplicated secondary anemia the results were almost as good. In children with bacteriemia, they withdrew a certain amount of blood from the patient before the transfusion.

Although I have no figures at hand to compare with those given by the Toronto authors, I have the impression that their figures for compatibility for father and mother and new-born infant approximate my own experience. There is an erroneous impression abroad that the blood of the new-born infant is always compatible with its mother. Those who act on this assumption will eventually get into trouble. The same may be said of the so-called universal donor who exists only in theory. It is doubtful whether one is ever justified, even in a serious emergency in transfusing an infants with its mother's blood without testing for hemolysis and agglutination. In the treatment of hemorrhage of the new-born, unless the blood has been typed, it is much wiser to trust to the injection of the mother's whole blood into the gluteal region of the child rather than risk transfusion.

In the treatment of bacteriemia, as outlined by Brown and his co-workers, with withdrawal of blood plus transfusion I have had no personal experience. It is being used in New York City in a limited way I understand, with most satisfactory results. Transfusion is used in a number of conditions in infancy and childhood with varying results. I have seen a few infants with severe malnutrition whose weight curve began to rise coincident with their first transfusion. I have seen an equal number so treated without results. On the whole, I should say that we do not resort to transfusion as frequently as we should. Although it is often disappointing, it is always worth a trial. In the past we have used it only as a method of last resort. Now we begin earlier and our results are better. There are in any hospital a few infants with severe malnutrition who have been in the wards from a period of a few weeks to months. A number of these may be given a sufficient stimulus with a few transfusions to allow of their discharge to the out-patient department or a convalescent home.

Blood Transfusion via Longitudinal Sinus; with Report of Cases. Lowenburgh,¹ of Philadelphia, writes enthusiastically of the longitudinal sinus route for transfusion in infants with an open fontanelle. He states that "it may be pierced without danger to neighboring structures. So close to the surface does it lie that the danger from subdural or epidural oozing and subsequent coagulation is slight, because bleeding, after withdrawal of the needle, may be readily controlled by slight rotary pressure applied for three to five minutes." He recommends the longitudinal sinus for the administration of blood for fluids in dehydration, and even goes so far as to suggest this route for the injection of salvarsan.

¹ Archives of Pediatrics, April, 1921, No. 4, vol. 38.

He gives an account of his technic of transfusion which is to be highly commended. In 13 transfusions, many done *via* the sinus route, he has had no untoward or serious effects.

Lowenburg remarks, "The immediate effect of transfusion by any method is almost dramatic. The infant's tissues become suffused and glow with the ruddiness of apparent health. The ears, the toes, the finger tips, the nose, the lips and all visible mucous surfaces, before pale and blanched, become red and lifelike."

One might well wish that all transfusions performed in infants had the immediate stimulating effect noted by Lowenburg.

The sinus route, in my opinion, is justified in certain selected cases where the condition of the infant warrants the use of a method attended by some risk. For routine administration of fluids, hypodermoclysis, or even intraperitoneal injectures, seem a much safer procedure. The administration of salvarsan into the longitudinal sinus is acknowledged by many, myself included, to be a somewhat dangerous procedure. The intramuscular injection of neosalvarsan, as described by Fordyce and Rosen,¹ fills a long felt want in the treatment of congenital syphilis. This simple method, free of danger, will, in my opinion, soon replace other existing methods for the administration of neosalvarsan to infants.

CONGENITAL SYPHILIS.

The Visceral Changes in Congenital Syphilis. Fraser² describes the visceral changes in congenital syphilis. He reminds us that the placenta is larger and heavier than normal, the weight often being to that of the body of the fetus as 1 to 4 against a normal of 1 to 6. The consistency of the organ is softer than normal, and at times it is even friable. He notes that the liver is nearly always firmer and heavier than normal. As a rule careful search reveals some foci of characteristic lymphocytic and plasma cell infiltration in the portal spaces. He observes the prevalence of changes in the heart and bloodvessels which do not differ from those found in the acquired disease. He incorporates Fordyce's figures of Rach and Weisner who found changes in the aorta and pulmonary artery in 67.4 per cent of their cases. In regard to the spleen, he quotes a statement from Veeder and Jeans to the effect that splenic enlargement in infants under six months is almost pathognomonic of either tuberculosis or syphilis. He quotes Nonne who noted that the occurrence of tabes and paresis is not rare in congenital syphilis, and that he (Nonne) has found tabetic children in ten different families. Fraser himself had examined the spinal cords of numerous luetic children, with negative results. He remarks that cerebral syphilis is more common and that in one case in which numerous spirochetes were demonstrated in the meninges, the brain pia arachnoid and dura were matted together in a diffuse gummatous mass.

In his examination of the necropsy records of congenital lues of three different hospitals, in no instance was there a lesion of the stomach.

¹ Journal of the American Medical Association, November 20, 1921, No. 21, vol. 75.

² Ibid., November 19, 1921, No. 21, vol 77.

In a case of ulcerative enteritis and colitis observed at Bellevue Hospital, in which the ulcerated areas were confined to a portion of the intestine six inches from the cecum, spirochetes were demonstrated. In Frasers' own experience the most common pathological kidney lesion was acute interstitial nephritis.

My own experience with congenital syphilis at the necropsy table is limited to the more pronounced types of infection which succumb during the first weeks or months of life. Martha Woolstein, our pathologist at the Babies' Hospital tells me that the commonest group of lesions encountered in these cases in the hospital include interstitial splenitis and perisplenitis; interstitial hepatitis and perihepatitis; osteochondritis and periostitis of the long bones, and, rather less often, nephritis, either interstitial or diffuse. The necropsy permission in nearly all our cases does not allow us the privilege of examining the skeletal system. If such examinations were allowed, I believe we would in nearly every instance find syphilitic changes in the bones. My basis for this assumption rests on the frequency in which we observe clinically epiphysitis in syphilitic children.

I make vigorous objection to Veeder and Jeans' statement quoted by Fraser that enlargement of the spleen in infants under six months of age is almost pathognomonic of syphilis or tuberculosis. I think that one should always have in mind the possibility of these diseases but there are many conditions occurring in infants under six months of age associated with enlargement of the spleen. In acute infections, in certain cases of rickets, in hemolytic icterus, in congenital cardiac disease, secondary anemia, acute lymphatic leukemia, sepsis, glandular fever, malaria, Gauchers' disease and von Jakschs' disease, there may be an enlargement of the spleen. There is always the possibility that an enlarged spleen may be due to a neoplasm. I saw recently a case of Banti's disease in a young boy (proven by microscopical examination after splenectomy) who had an enlargement of the spleen dating from the first few weeks of life.

Fate of Children with Congenital Syphilis. Husten,¹ of Freiburg, discusses the fate of children with congenital syphilis. In a study of 39 cases in the five years ending in 1918, he reports that half the children soon died from intercurrent disease and only 16 are known to be still alive; a third died, of those given partial treatment, but of those given thorough treatment only 1 died. Of the 14 still living, 50 per cent are imbeciles or idiots.

Husten answers a question we often ask ourselves. What is the outcome in the type of congenital lues we encounter in our dispensaries and hospitals? Let us hope that our results are not so disastrous as those above quoted. Most of us have no means of learning end-results as these patients frequently disappear from view after the obvious lesions have cleared up. Conditions relating to the treatment of congenital syphilis have greatly improved in the last few years owing to the formation of classes in many dispensaries for their special care.

¹ Archiv für Kinderheilkunde, May 21, 1921, No. 5, vol. 69; Abstract, Journal of the American Medical Association, July 23, 1921, 77, 4.

We now aim not only for a clinical cure, but also a serologic cure. No child should be considered cured until he has had repeated negative Wassermann reactions. It has been stated that it is extremely difficult to effect a serological cure in a child with congenital lues. Fordyce and Rosen have obtained a serological, as well as a clinical, cure in a large per cent of their cases, using the treatment as outlined in *PROGRESSIVE MEDICINE* for March, 1921.

Incidence of Hereditary Syphilis. Jeans and Cooke¹ made a study of the condition of the placenta and the Wassermann reaction on the cord blood on a series of 2030 unselected infants. Through an examination of the blood of 329 of these infants after the second month of life, it was determined that the proportion of cases of hereditary syphilis that could be diagnosed by placental examination alone was 27 per cent, while from the Wassermann reaction on the blood of the umbilical cord 63.6 per cent of the cases could be diagnosed. It was determined by these methods that the incidence of hereditary syphilis in the colored race was 15 per cent, 1.8 per cent in the poor of the white race, and less than 1 per cent among the well-to-do whites.

In the application of these figures to the whole population of St. Louis, they estimated the following to be the incidence of hereditary syphilis at birth. In the whole population 3 per cent; of which the negroes although only 9 per cent of the total population furnished 50 per cent of the cases.

The Wassermann Test and Its Limitations in Diagnosis and Treatment. From the laboratory of the Lenox Hill Hospital comes a pertinent report about the Wassermann test obtained from an experience in 28,000 tests. The following paragraphs give us much of the information we need to properly interpret the Wassermann reports we receive from laboratories. It may clear up some of the confusion which arises when we receive a negative report from our laboratory and a positive from another. It is the duty of the clinician to establish an acquaintance with complement-fixation technic in order to intelligently utilize laboratory reports. "There are in general use three types of antigen: cholesterinized, acetone insoluble, and alcoholic; and these three types are usually extracted from either beef or guinea-pig heart. The delicacy of these reagents varies, the cholesterinized generally being the most sensitive, the acetone insoluble next, and the alcoholic least sensitive. Usually, antigens made from beef heart are less sensitive than those made from guinea-pig heart. It is not uncommon to find a serum which is negative with an alcoholic antigen and four plus positive with a cholesterinized antigen, both tests having been performed at the same time on different portions of the same serum. In a series of 6000 serums in which both antigens were used, Rohdenburg, Garbat, Spiegel, and Manheims² found this to occur 98 times. It is easily conceivable that one laboratory using only the alcoholic antigen may report negative, while another using only the cholesterinized antigen may report positive on the same serum, and still both laboratories can be certain of their results according

¹ American Journal of Diseases of Children, October, 1921, No. 4, vol. 22.

² Journal of the American Medical Association, January 1, 1921, No. 1, vol. 76.

to their individual technics. It is for this reason that we believe that a laboratory report should state the type of antigen used.

"**FIXATION.** One of the steps in performing the reaction consists of allowing the antigen and antibodies present in the serum to fix themselves to the complement. This is known as fixation, and may be done either in the incubator or water bath at 37° C. for one hour, or in the ice-box at from 4° to 10° C. for three or more hours. Ice-box fixation has been shown by various workers to be more sensitive, thus giving more positives, than is fixation at higher temperature. Again, we are confronted with the possibility of a negative report from one worker using the water bath, and a positive report from another using the ice-box. Each may be right according to his method; but unless the clinician knows which method has been used, the interpretation of the report may be incorrect. In a series of 1800 tests in which both ice-box and water-bath fixation were used on the same serums and with the same antigen, 12 instances occurred in which water-bath fixation gave a negative, and ice-box fixation gave a four plus positive.

"**NATURAL AMBOCEPTOR.** It is well established that certain human serums contain a natural amboceptor against sheep's red blood cells in such amounts that, unless it is allowed for, false negatives will result if the usual dose of amboceptor from a rabbit is added. Here, again, one laboratory not allowing for the presence of natural amboceptor may report negative, while another laboratory, in which this factor is controlled, may report positive on the same specimen. In a series of 350 serums run in duplicate, one set tested for natural amboceptor, the other not, 4 instances occurred in which the natural amboceptor was present in amounts large enough to have altered a positive reaction to a negative, unless the presence of the natural amboceptor had been allowed for."

Unless the Wassermann test is performed by one who is highly skilled in the technic, it is better to omit the test entirely. A false assurance may ensue from a negative test which may have disastrous results.

TUBERCULOSIS.

Medicine and Histopathology of Tuberculosis of Tonsil. Weller,¹ in a study of tuberculosis of tonsils, found the incidence of tuberculosis in his series based on tonsillectomies of all ages to be 2.35 per cent. He divides tonsil tuberculosis into three types: "faucial crypt infections; ulcerative lupus-like lesions; and diffuse miliary tuberculosis." He found the crypt infection, which is the most important from the practitioner's viewpoint, to be the most common. It was unusually unilateral, involving one or more crypt areas and avoided the lymph follicles. Some of the cases were autoinfections in open respiratory tract tuberculosis, but he believes the majority should be considered cases of primary faucial tonsil tuberculosis.

Portals of Entry and Mode of Spread of Tuberculosis in Hongkong. Scott,² of Hongkong, in a study of the portals of entry and mode of spread

¹ Archives of Internal Medicine, June 15, 1921, No. 6, vol. 27; Abs., Journal of the American Medical Association, No. 2, vol. 77.

² Annals of Tropical Medicine and Parasitology, September 30, 1921, No. 3, vol. 15; Abstract, Journal of the American Medical Association, No. 21, vol. 77.

of tuberculosis, noted among 255 cases in children under ten years of age that in 65 per cent the portal of entry was respiratory.

In only 13 per cent was the portal of entry definitely alimentary. Only 4 cases of isolated primary tuberculosis of the intestine were found. The proportion of respiratory to alimentary portal of entry was as high as 4 or 5 to 1.

Sir Harold Stiles,¹ of Edinburgh, in a recent lecture has given us a résumé of his experiences with bone tuberculosis which cover a period of years of study at one hospital. Conditions in Scotland relating to the supervision of dairies and the purity of milk are almost medieval as compared with conditions prevailing in New York City. He stated that 30 per cent of the cattle in Great Britain were tuberculous and of 402 samples of milk collected from all the milk distributing centers in Edinburgh 20 per cent contained enough tubercle bacilli to kill guinea-pigs.

He drew a comparison between the wide prevalence of bone tuberculosis north of the Tweed, where milk is consumed in large quantities, and the infrequency of the same disease south of the river where ale and beer are the customary beverages of both children and adults. In a town in the north of England where he was born so little milk was consumed that one "can" was sufficient to supply the daily needs of the community.

He proves beyond the question of a doubt that the multiple bone tuberculosis which exists so commonly in Scotland is of bovine origin. In his experience, the tonsil is the portal of entry for the bovine tubercle bacillus. In an examination of a large group of tonsils removed at operation, he demonstrated that of all hypertrophied tonsils 9 per cent are tuberculous and 37 per cent of all "bad tonsils" are tuberculous. In a large group of children with cervical adenitis, 90 per cent were bovine tuberculous, and of those with bone tuberculosis 60 per cent were of bovine origin.

Conditions in Scotland are not comparable to conditions here. He cited a number of instances in which children were drinking milk from cows with extensive tuberculous lesions of the udders. In one specific instance a child was given the milk of a cow which had such advanced tuberculosis that she was too weak to stand up to be milked.

In France and Germany, bovine tuberculosis of the bone of children is not common, probably because in these countries the milk given to infants is generally boiled.

All the milk sold in New York City is either certified or pasteurized, the inspection of cattle for tuberculosis is carried on with thoroughness in this section of the country, in consequence we encounter relatively little bone tuberculosis in children as compared with Scotland. In infants and young children we frequently encounter general miliary tuberculosis and tuberculous meningitis, less often tuberculous peritonitis. In my opinion, although we cannot always prove it, the first two varieties are acquired in almost every instance from direct exposure to some member of the family with pulmonary tuberculosis. I fancy that some of the cases of tuberculous peritonitis are of bovine origin.

¹ New York Academy of Medicine, October 20, 1922.

The most dangerous types of individual with pulmonary tuberculosis are those who do not know they have the disease and those who think they are cured. These are the individuals who are most likely to infect infants and young children.

CHRONIC INTESTINAL INDIGESTION.

Prolonged Intolerance to Carbohydrates. Howland, in his presidential address before the thirty-third meeting of the American Pediatric Society, warns us again of the dangers connected with the administration of excessive amounts of sugar to infants. He observed in infants with sugar intolerance that there was a tendency to diarrhea, even when taking woman's milk.

In treating infants with sugar intolerance, he found that protein milk was the ideal food theoretically, which practically gave excellent results. He advocates, in these cases, the omission of all carbohydrates for long periods.

In chronic intestinal indigestion, he believes not only in an almost starch-free diet but in the administration of protein milk for long periods. He divides the treatment into three stages: First, with protein milk alone for a number of days or a few weeks. He prefers it to buttermilk on account of its higher caloric value and lower sugar content. The diet in the second stage consists of protein milk with the addition of other foods high in protein, as curd, scraped beef, cheese, egg-white, and eventually whole egg. He does not begin the second stage diet until the stools have become firm, the gas diminished, and the appetite good. The duration of the second stage varies from months to years. In the third stage, carbohydrates are slowly added. Bread, cereal, and potato, Howland regards as the most dangerous and the last to be added to the dietary of the infant with chronic intestinal indigestion.

All the cases of chronic intestinal indigestion which I have seen have been due to carbohydrate intolerance. That starches were the offending agent, was proven by the improvement following their withdrawal. German writers describe cases of this disease also caused by fat intolerance, and others by protein intolerance. These last two must be rare as I have never knowingly encountered them. The dietary schedule, as outlined by Howland, is the same which is used in the Hospital with which I am connected. For the first week or two of treatment, it is wise to have these patients under hospital control. After their discharge, successful results can be achieved only when the best of coöperation can be attained at home not only for months, but for years. The greatest mistake in the handling of these patients is in the endeavor to make them gain in weight too rapidly. Rapid gain in weight cannot be expected until the child is receiving starches; the limit for starch tolerance is soon reached; a rapid return of symptoms follows, and the diet has to be again restricted to protein milk.

Cod-liver oil seems to be almost specific in these cases. After the stools have been controlled by the protein milk, it should be one of the first fats introduced into the diet.

Fatal Case of Celiac Infantilism. Miller,¹ in the London *Lancet*, described a case of celiac infantilism in which postmortem examination failed to reveal any chronic changes in the pancreas, liver, intestine or elsewhere to account for the prolonged failure in fat digestion. He concludes that celiac disease is independent of organic changes and thus must be due to a digestive fault, possibly a defective action of the bile on fat absorption.

The English use the term celiac disease to describe the condition which is known to us as chronic intestinal indigestion. The term infantilism is rather loosely applied by some clinicians in connection with all cases of celiac disease.

The present state of our knowledge of these condition is so inadequate that we are unable to tell at what stage in the course of celiac disease we are dealing with infantilism. Many cases of celiac disease are mild, and clear up after a few months of treatment. Others are so severe that it is only after a number of months of careful régime that signs of improvement are noted. In these severe cases there is occasionally dwarfing of varying degree. In the severe types, with arrested growth, in which the digestive disturbances have been controlled, there may be a clinical picture resembling the infantilism of Herter. Doubtless there is some disturbance other than a digestive one to account for the arrested growth. We do not know the nature of this disturbance. It is probably not of endocrine origin or else the administration of the various glands would be likely to stimulate growth in these children.

Renal Dwarfism. A type of renal dwarfism has recently been described by Barber.² In these cases it is generally noted about the seventh year of age that there is an arrest of development. As the child grows older the dwarfism becomes more obvious and bone deformities tend to develop. Polyuria and polydipsia are present. The urine is pale with a low specific gravity and albumin is generally present. Five post-mortem examination are reported by Barber with nearly similar findings. The kidneys were extremely small, varying from 120 grams in a boy aged fifteen years, to 300 grams in a boy aged sixteen years. Microscopically, there was interstitial nephritis varying in degree with the size of the kidney.

THERAPEUTICS.

General Consideration Regarding Serum and Vaccine Therapy. Flexner³ gives an outline of our present knowledge concerning serum and vaccine therapy which is much needed at the present time when even good physicians are yielding to the clever advertisers of biological products, who seem willing to sell a vaccine or a serum for almost any disease. Some medical men who use these biological products for a great variety of conditions, do so in the sincere belief, based on erroneous judgment, that they are helping their patients. There are others, however, whose motives are less pure but who are shrewd enough to know that vaccine

¹ *Lancet*, April 9, 1921, **1**, 5093.

² *Quarterly Journal of Medicine*, April, 1921, **14**, 25.

³ *Journal of the American Medical Association*, January 1, 1921, No. 1, vol. **76**.

therapy, in the eyes of the laity, is clothed with occult power and for that reason helps to fill the waiting room. Mention is made by Flexner that diphtheria is still the outstanding example of a therapeutically active serum, while tetanus antitoxin has a high protective, but a lower therapeutic, value. These sera do not act on the invading organisms themselves but on their liberated toxins which they neutralize. Most of the infectious diseases are induced by toxins held or closely bound to the bacterial bodies themselves. This form of toxin is called endotoxin to distinguish it from the loosely united form of toxin. The former form is not only given off with difficulty by the bacteria, but is also less well adapted for the immunization of animals.

Flexner, in referring to the classification of the pneumococcus into the four recognized groups, remarks, "The immense gain to therapeutics of this classification arises from the fact that a therapeutically active serum has been produced only from Type I pneumococcus. Hence anyone who treats pneumonia rationally with antipneumococcic serum must confine his efforts to cases of Type I pneumococcus pneumonia, proved such by laboratory tests. Only these may be treated with Type I antipneumococcic serum. To go beyond this simple demonstrable fact and attempt to treat pneumococcus infection by the use of a so-called "polyvalent" antipneumococcic serum, is not only futile, but in the present state of knowledge, unscientific.

"The outstanding need at present is to restrict the therapeutic employment of antisera to what has been proved and is experimentally demonstrable, and not to resort to their empiric use on insufficient grounds of activity.

"A similar mental attitude toward 'vaccines' is to be desired. Exact agreement or parallelism does not exist between the immunizing power of certain vaccines and their capacity to yield effective therapeutic antisera. Thus, it was stated above that the typhoid bacillus does not yield such a therapeutic serum, and yet typhoid vaccination is an effective bar against typhoid bacillus infection (typhoid fever); similarly, although an active antistaphylococcic serum has not been produced, still staphylococcus vaccine is therapeutically valuable in furunculosis, etc.

"The antisera are employed in two different ways, and in order to accomplish two quite dissimilar purposes: 1. As therapeutic or curative agents. To this use all the active antisera are devoted. 2. As protection after exposure to certain diseases (diphtheria), or after injury (tetanus antitoxin). The second use is a subordinate one except in the case of tetanus antitoxin, regarding which it is the principal one. But the protection afforded by this so-called passive immunization is in all instances relatively brief and endures only for a few weeks.

"The facts regarding the use of vaccines are the reverse. Their main field of usefulness is protective; and as they induce active immunity their effect is enduring. The length to which this protective vaccination may be successfully and properly carried has not yet been determined. The outstanding success is typhoid-paratyphoid vaccination, but other successes relate to cholera and possibly to the type of pneumonias.

"The curative value of vaccines, on the other hand, is a subject far less easily dealt with. The idea that vaccines can be used to combat generalized infections, because when injected under the skin they utilize the local tissues to elaborate healing immunity substances (antibodies), is a mere hypothesis that has never been verified. The lymphatic internal organs are the only ones known to be active in producing them, and hence the inoculation of killed cultures or 'vaccines' in acute infections may merely amount to the adding, as it were, of fuel to the flames. And what in this respect is true of the bacterial bodies as a whole, as they exist in the vaccines, is true also of extracts or other preparations made from them."

That an autogenous vaccine has been useful in a certain case of cellulitis is no proof that autogenous vaccines are specific therapy for cellulitis; yet some men reason in this fashion. Vaccine therapy in cellulitis is probably not harmful but it is well to combine this therapy with other measures if results are to be obtained. And so, with vaccines in other conditions where specificity has never been claimed, if you will use them, do not lean upon them too heavily but combine your treatment with other measures which have stood the test of long years of clinical experience.

The Use of Antimeningococcus Serum in the Treatment of Epidemic Meningitis. Blackfan¹ reviews the mortality figures collected both before and following the use of antimeningococcus serum which leaves no doubt in the mind of even the skeptical that the introduction of Flexner's serum has been one of the great achievements of modern science. He emphasizes the value of early administration and comments on the poor results occasionally obtained which can be sometimes attributed to low potency of the serum or to the fact that the serum used, even though polyvalent, may not contain agglutinins for the organism isolated from the spinal fluid of the patient. He sums up the several factors leading to successful therapy:

1. A serum potent for the causative meningococcus should be employed.

2. The serum should be injected as early as possible in the course of the disease.

3. The serum should be injected into the spinal canal or into the ventricles, or both, so that it comes directly in contact with the meningococcus.

5. The chief action of the serum is to destroy the organism. For this reason it must be constantly present in as great a concentration as possible. Therefore it should be injected at frequent intervals and in as large amounts as are safe.

5. Serum should be discontinued only after the disappearance of the organisms and with improvement in the general condition of the patient.

His scheme of therapy is as follows: For the mild cases he gives a daily injection by gravity method in 10 to 20 cc amounts or from 5 to 10 cc less serum than the amount of fluid withdrawn. The dose is repeated

¹ Journal of the American Medical Association, January 1, 1921, No. 1, vol. 76.

daily for three to four days or longer, depending upon results obtained. In the more severe types he repeats the injection every twelve hours for 3 to 4 doses and thereafter every twenty-four hours. The persistence of organisms in the cerebrospinal fluid necessitates further injections until the spinal fluid is sterile. After several days have elapsed following the last treatment, a follow-up lumbar puncture is made for culture and cell count. If symptoms persist, and if it is impossible to secure fluid by further lumbar puncture, he advises the introduction of serum into the ventricles either through the open fontanelle or by trephine opening. Blackfan passes rather lightly upon the question of intravenous therapy apparently in the belief that, except during epidemics, the diagnosis of primary meningococcus sepsis is extremely difficult to make. He further states that, "It would seem rational and advisable to give serum intravenously in all cases were it not for the fact that the intravenous injection of antimeningococcus serum is associated invariably with a severe systemic reaction." He noted the deaths of 2 children which could be attributed to the intravenous serum therapy. He discouraged this form of treatment in children except in meningococcemia alone or in those cases of meningitis in which the organism persists or reappears in the blood.

I have the opportunity of seeing every year from 5 to 10 sporadic cases of meningitis in infants. These are usually of the milder form and are first observed when the meninges are involved. I doubt if these milder cases of the disease could be recognized in the premeningitic stage of the disease except in the presence of an epidemic. The more severe type of the disease in infants, I am inclined to believe we might sometimes recognize in the premeningitic stage even though the eruption is not present. I am quite in accord with Herrick¹ who remarks, "Such prominence has been given the meningitis that the premeningitic stage of meningococcus sepsis has been, for practical purposes, disregarded." In a great many of Herrick's cases with sepsis, the disease was controlled by early administration of serum intravenously and cure resulted without invasion of the meninges. I have only had the opportunity of seeing one case of meningococcus sepsis in a child, since the advent of serum therapy. This was in a six year old boy with extensive purpura who was given intravenous therapy without severe reaction. I had the opportunity of watching a number of the cases described by Herrick, and it is my belief that we should be constantly on the alert for the early recognition of meningococcus sepsis with the view of the earliest possible use of intravenous therapy.

If extreme care is exercised in the technic of intravenous therapy, this includes desensitization of the patient and extremely slow injection of the serum, the danger of reaction is minimized.

Treatment of Furunculosis in Infants. Grulee and Rose² report that the customary vaccine and antiseptic treatment of furunculosis in infants, having proven ineffective in their hands, they were tempted to try

¹ The Intravenous Serum Treatment of Epidemic Cerebrospinal Meningitis, *Archives of Internal Medicine*, April, 1918, 21.

² *Journal of the American Medical Association*, July 2, 1921, No. 1, vol. 77.

roentgen-ray therapy in a selected group of cases. They concluded that the results were not startling but the impression prevailed that the results were favorable. They believe it best to use a soft ray and no filter.

From a perusal of their case reports one is left with the impression that the cases were mild ones and with but few furuncles, and might have responded to simple measures or cleared up spontaneously. Sunlight and the roentgen ray may be closely related in their action. My own custom is to expose these infants to the sun's rays beginning with twenty minute doses and increasing the dosage daily. In the very extensive cases which one sees in the malnutrition wards of our hospital, it would be obviously impracticable to treat by roentgen ray. Roentgen ray may prove most useful in cases of long standing where the lesions are fairly well localized, but, until we are more familiar with this form of therapy, it would seem safer to restrict our treatment to heliotherapy and the old established local measures.

MISCELLANEOUS INFORMATION.

Hysteria in the Nursery. Cameron,¹ physician in charge of the children's department of Guy's Hospital, London, has contributed a short article on Hysteria in the Nursery, the reading of which will amply repay any physician particularly one who is the father of small children. He quotes Babinski's definition: "Hysteria is a pathological state manifesting itself by troubles, which it is possible to reproduce by suggestion, in certain individuals, with perfect exactitude and which can be made to disappear under the influence of persuasion (contra-suggestion) alone."

Cameron believes that the child is passively molded in accordance with the reputation which attaches itself to him in the household. In other words, it is the adaptation of the child to his environment. When the environment is dominated by the child, when he realizes that the whole atmosphere about him is bright or cloudy depending upon his whims, it is then that such symptoms as refusal of food, (anorexia nervosa) refusal of sleep, enuresis and constipation are encountered. "Whatever is feared for the child, whatever occasions most distress to the parents, to that, not unconscious of his power to disturb, the child seems irresistibly compelled. Yet his power of dominating the situation by his abnormal conduct affords him no satisfaction. It is clear that he too shares in the unhappiness and sense of alarm." Cameron further correctly states that children differ greatly in their susceptibility to such suggestions and that with some gross faults of management produce but little disturbance.

He cites cases produced by suggestion, one a hysterical contracture of the hand, of six months duration, in a boy aged five years. The separation of this child from his mother at once produced improvement and ultimately complete recovery.

¹ Archives of Pediatrics, March, 1921, **38**, 193.

Cameron suggests that hysterical symptoms, such as contracture paralysis or anesthesia, are extremely rare in childhood because suggestions of this nature are but rarely made. Nervous vomiting, constipation, anorexia nervosa, disorders of micturition, etc., are common conditions because it is upon these disorders that the mind of the anxious parent dwells. The parents stress the proper functions of the digestive system with the result that a great variety of hysterical symptoms relating to the digestive system occur. Almost half the office practice of the pediatricist is concerned with conditions resulting from faulty management. The most common complain encountered is loss of appetite with consequent loss of weight or failure to gain. There is great variability in these conditions of anorexia. With some, all foods are refused except milk, which may be taken from a bottle in large quantities. The child's stomach is filled with milk at regular intervals. This insures sufficient distention to create a feeling of well-being but does not furnish a proper ration for growth and development. Constant nagging on the part of the misguided parent, frequent efforts to make the child take other food, results in making both the child and parent irritable without the desired result being obtained. The only method of securing results in this type of case is to entirely omit the milk from the dietary and allow the child to become so hungry that he will gladly take other articles of food offered him. This sounds simple enough but to insure success it is necessary to have the complete coöperation of nurse or mother, as not infrequently three to four days will elapse before these children become sufficiently hungry to capitulate. During this waiting period no effort should be made to coax the child to take the new dietary and the parent or nurse must be on guard lest the child should appreciate that his hunger strike is a matter of importance.

The other varieties of anorexia should be treated the same way. The type who picks and nibbles at his food and takes but half his required calories; the child who has a capricious appetite and will eat only certain foods in spite of the well-meaning admonitions of his parent. Not infrequently a complete change of personel and environment will insure rapid success. Quite recently I encountered a twenty months boy who weighed but $18\frac{1}{2}$ pounds. He was an only child and his mother was almost hysterical over the fact that he was only taking certain articles of food, was losing weight in spite of constant coaxing, and constantly changing tonics. I suggested starting him on 2 per cent lactic acid milk which he refused. A nurse was installed, with directions to offer him the sour milk every four hours and omit all other food. He showed signs of capitulation at the end of the third day but promptly vomited the food. The mother at this point declared the child was in a weak condition and would probably starve unless he was given his favorite foods. The fourth day he took 14 ounces of the sour milk and on the fifth he had taken 24 ounces and was asking for more. Other articles of food were gradually introduced until he was getting a suitable dietary. His disposition completely changed and he became a pleasant, happy child, and thereafter showed no symptoms of anorexia nervosa.

Chronic Intussusception in Children. Still,¹ of King's College Hospital, London, reports 4 cases of chronic intussusception, the youngest in an infant of thirteen and a half months the oldest occurring in a child of three and a half years. He states that "chronic" is used by him to define cases in which the intussusception is present for days or weeks without causing acute obstruction. The symptoms are pain at onset and occurring at intervals during the course of the disease, vomiting, constipation and occasionally a slightly blood-streaked stool. The child becomes markedly wasted. The diagnosis is made by the palpation of a sausage-shaped tumor. In one case the symptoms were present thirty-two days, in another forty-two days, and in a third twenty-one days before the diagnosis was established. The condition, in Still's experience, is frequently mistaken for tuberculous peritonitis. As a point in differential diagnosis, he notes that the tumor varies in hardness during palpation as if undergoing contraction. At operation, in all 4 cases, the intussusception was reduced without difficulty, the patients making an uninterrupted recovery. Chronic intussusception must be a rare condition among infants and young children, as no mention of it is made in Holt's *Diseases of Infancy and Childhood*. A few years ago a boy walked into a dispensary with which I am connected, complaining of colicky pains in the abdomen of six days duration. No mass was felt, there had been no vomiting, and no blood in the stools. He had not been in bed during this period but was forced to lie on the couch from time to time during the paroxysms of pain.

An exploratory operation was performed and an intussusception was found high up in the right upper quadrant under the liver. The patient made an uninterrupted recovery.

Although the condition, as Still states, is a rare one, this brief abstract may serve to remind us that it does occur and that we should bear it in mind when examining infants and children presenting obscure abdominal symptoms of long duration especially those resembling tuberculous peritonitis.

Retropharyngeal Abscess. Frank,² of Chicago, has presented an admirable article on retropharyngeal abscess, the most complete which has appeared in a number of years. This condition, which may result seriously, particularly in infancy, occurs with sufficient frequency to make us remain on the alert for its early detection.

Among Frank's 74 cases, 70 occurred in children under ten years of age. He quotes Vas' series of 1054 cases in whom 59 per cent occurred in the first year of life. Among Frank's own group, the youngest patient was three weeks of age. In his description he purposely omits all reference to retropharyngeal abscess due to caries of the vertebrae. In discussing the anatomy, he reminds us that the retropharyngeal glands lie in the loose areolar tissue behind the pharyngeal wall at the level of the upper two cervical vertebrae. The most important of the four groups of glands lying on each side of the mid-line of the pharynx is the more lateral chain composed of one or two glands, rarely more, arranged vertically.

¹ Archives of Pediatrics, March, 1921, No. 3, vol. 38.

² Journal of the American Medical Association, August 13, 1921, No. 7, vol. 77.

Superiorly, they are found just median to the carotid interna near the entrance to the carotid canal. Projecting downward they are often found below the soft palate in the posterior pharyngeal wall lateral to the mid-line and almost hidden by the posterior pillars. In infants and children there are occasionally present a group of small glands, often bilateral, in a more median position. In the first year of life there may be from three to ten, or more, glands present but atrophy and retrogression reduces the number in adult life to one or two. Frank informs us that retropharyngeal glands receive afferent lymphatic vessels from the accessory sinuses of the nose, the nasal fossæ, the pharynx and larynx.

As regards pathology: Frank believes it unwise to subdivide and classify the clinical retropharyngeal suppuration. "Anatomically, the various subgroups of the deep cervical glands lie close together; physiologically, they are continuously interdraining; clinically, one or more of the glands suppurating and pointing in the retropharyngeal space becomes a retropharyngeal abscess." He aptly states that all the variations of retropharyngeal abscess are merely suppurative processes in one or more of the post-pharyngeal groups pointing in the direction of least resistance, increasing in size and content and controlled by the neighboring planes of deep cervical fascia, as a circumscribed intraglandular abscess, or rupturing and burrowing beneath the fascial planes.

1. If there is no surgical intervention, the following courses are open. The abscess may rupture spontaneously.

2. The pus may burrow its way laterally to the side of the neck behind the large vessels and the sternocleidomastoid muscle, guided by the prevertebral fascia, behind which it is situated, into the posterior lateral triangle of the neck. Or should it weaken and rupture through the fascia, it may present itself anterior to the sternocleidomastoid muscle in the anterior triangle.

3. The pus may be guided downward by the prevertebral fascia to the lower part of the neck. The fascia passes behind the subclavian trunks, and, forming the posterior wall of the sheath of the axillary vessels, may actually guide the pus under the clavicle and into the axilla. (This rare type is usually the chronic cold abscess of a cervical Pott's disease.)

4. The abscess may travel downward behind the esophagus into the posterior mediastinum.

He quotes Goldstein's explanation of the greater frequency of the condition in childhood as compared with its incidence in adult life. He voices the opinion that, "In the light of the known unusual activity of the lymphoid tissue and the lymphatic ring in very young children, it would be logical to 'assume that whenever an acute infectious process takes place in the nose, nasopharynx, accessory sinuses, ear, tongue or larynx, a continuity of lymphoid tissue may carry such an infection into the depths of the pharynx walls'—where, during childhood, are an unusual number of nodes."

Frank is of the opinion that the retropharyngeal lymph nodes in early life are the chief filters of efferent vessels from the adenoid growths. As the life cycle of the adenoid tissue closes, their stage of usefulness

likewise passes and they are gradually destroyed by chronic progressive fibrosis and degeneration.

Frank reminds us that the diagnosis at times presents considerable difficulty. He notes that often the onset is so insidious that the diagnosis is not made until the local process has increased to such an extent that it interferes with respiration, deglutition, or both. He observed that when the swelling was situated high in the pharyngeal wall, there was no interference with respiration but difficulty of swallowing is present, and a nasal intonation in the voice is noted. If the swelling is lower in the throat, respiratory symptoms become more prominent.

Frank is impressed with the position of the head as a diagnostic sign, dyspnea and an irritative cough somewhat simulating croup. He states that all writers argue that palpation offers the most satisfactory means of diagnosis. He mentions that the condition is sometimes confused with cervical Pott's disease and occasionally with osteomyelitis of the vertebræ which, when located anteriorly in one of the cervical segments of the spine, forms a burrowing abscess in the retropharyngeal region.

He also warns us that infections of the upper respiratory tract may produce a lymphadenitis in the retropharyngeal nodes, without the formation of pus. "It should be borne in mind that the absence of fluctuation does not rule out abscess, nor does failure to locate a soft area. In many instances, the pus pocket is deeply buried behind the thickened indurated pharynx walls, making it sometimes impossible, in even fully developed abscess, to locate fluctuation."

The author enumerates the complications which may arise in the course of retropharyngeal abscess. They are:

1. Invasion of the blood stream which may result in distant foci of infection.
2. Hemorrhage produced by erosion of the large vessels of the neck.
3. Rupture into the esophagus.
4. Mediastinitis.
5. Pressure on the epiglottis or larynx with consequent edema.
6. Spontaneous rupture resulting in aspiration pneumonia or lung abscess.

He mentions that many surgeons prefer external incision and drainage rather than simple incision with a guarded bistoury which is the favorite method of most pediatricists and laryngologists. Frank himself inserts his index finger into the mouth of the patient to locate the most pronounced area of softening. He then introduces an artery clamp, moderately pointed without teeth, into the body of the abscess and this is withdrawn with the blades widely opened. As soon as the abscess is opened, the child is turned quickly face downward with the body elevated above the level of the head. In my own experience infants with retropharyngeal abscess differ greatly in their symptomatology. In some it is noted by the family that following a cold the infant began to have difficulty in breathing and eventually, a retracted head. In others, no difficulty in breathing is noted at the onset but an external swelling about a half inch below the middle third of the ramus of the jaw

first calls itself to the attention of the parents. As this swelling externally becomes less prominent (the pus travelling toward the path of least resistance, which is inward), the child begins to have difficulty in breathing and swallowing. The third type resembles in every respect a peritonsillar abscess and it is often impossible to tell whether the pus is peritonsillar or due to a broken down gland. One should be extremely cautious in examining these patients. The abscess may rupture during examination and not infrequently the infant has great difficulty in breathing following a digital examination. This is probably due to swelling or edema from traumatism. During the last year I have known of two serious accidents occurring during digital examination. One was a marantic infant who died during the examination, the other was a poorly nourished infant who went into collapse following a digital examination and was resuscitated with great difficulty. Both of these infants had large abscesses.

The treatment is not free of danger. Frank himself acknowledges among his own patients, two died of hemorrhage. Whether the incision should be external or internal depends upon the individual case. If the swelling is pointing externally, in my opinion it may be wiser to incise from without. If there is no appreciable external swelling, it is probably better to incise from within, although the surgeon may feel that there is always a possibility of secondary hemorrhage. If I had one myself, I should hope that external drainage could be secured.

Treatment of Ringworm of the Scalp by the Roentgen Rays. Fox and Anderson¹ have outlined their treatment of ringworm of the scalp by the roentgen ray. Although this method belongs to the realm of dermatology, these cases are generally first seen by the family physician. The family consider ringworm a rather trivial condition which should be cured by one visit plus a prescription for a lotion or an ointment. Unfortunately, the younger medical adviser is apt to take this attitude until he has had a few disappointments. I have seen a number of cases of ringworm of the scalp in children in an out-patient service covering a number of years but I do not recall one which yielded to any of the customary remedies. Of late years I have referred them all to special clinics for roentgen treatment.

Without going into the details of the treatment outlined by Fox and Anderson it is essential to state that after a close cropping of the hair the entire scalp is irradiated at one sitting of half an hour. The hair begins to fall out between the second and third week following the treatment, the head remaining bald for a month or six weeks, after which the downy and then the normal hairs make their appearance. When the hair begins to fall, the scalp is washed daily and a 5 per cent ammoniated mercury is applied with the object of killing the spores on the falling hairs and assist in preventing reinfection.

Whenever the defluvium was incomplete at the end of the third week, the remaining hairs were removed as far as possible by adhesive plaster or forceps. The authors state "While some of the children were not

¹ Journal of the American Medical Association, October 23, 1921, No. 17, vol. 77.

cured at the first treatment, at least no injury has been done in any case to our knowledge."

From the fact that antiparasitic remedies do not penetrate the hair follicles to any extent as long as the hairs remain, the rational treatment of ringworm of the scalp would seem to be limited to irradiation by the roentgen ray.

Fox and Anderson reached the following conclusion regarding this form of treatment, "With reasonable care it is safe, rapid, and efficient."

Pylorus Spasm in Infants. Von Bokay¹ brings up the subject of spasm of the pylorus in infants and protests against immediate operation as soon as hypertrophy of the pylorus is diagnosed. He believes that a much larger proportion of cases is due to spasm than is generally supposed and that a narcotic should be tried before considering operation. He advocates systematic subcutaneous injection of papaverine hydrochloride. He describes 8 cases in which the pylorus could be palpated as a hard cylinder but under the papaverine the whole subsided. The dosage of papaverine was, in my estimation, extremely high. Von Bokay is evidently unfamiliar with authoritative literature on the subject of pyloric hypertrophy in infants, if he assumes that every infant with a pyloric tumor is on his way to the operating table. There is at present in this country almost a unanimity of opinion that operation is definitely indicated only in selective cases. Many infants with a tumor at the pylorus in which there is a consequent narrowing of the lumen at the pylorus but not a total obstruction, can be managed with what is known as "medical treatment." The feeding of thick cereal and milk mixture is generally the most effective form of therapy. Drug treatment alone in my opinion is most disappointing. Von Bokay naively remarks that under papaverine treatment the tumor in a number of his cases subsided. One would have to have a sublime faith in any drug therapy to take such a statement seriously. It is sometime a most difficult matter to feel a tumor which at operation has proven to be considerably larger than a grape. One can imagine how much more difficult it would be to feel such a tumor if one held the belief that drug therapy could account for its disappearance. In regard to spasm of the pylorus a diagnosis which is not infrequently made, there is little to be said beyond that it conveys a meaning relating to a group of symptoms. I have never been convinced that such a condition as spasm of the pylorus exists except in the presence of a pyloric tumor.

The Diagnosis of Peritonitis and Peritoneal Transudates by Means of Abdominal Puncture with Capillary Tube. Denzer² brings to our attention a new method of abdominal puncture for the diagnosis of peritonitis and peritoneal transudates. His instrument, which is a great improvement over anything yet devised for abdominal puncture, consists of a short needle and trocar of about twenty gauge. The needle is introduced through the skin into the peritoneal cavity, the trocar is withdrawn and a capillary tube 5 inches long made of hard glass is intro-

¹ Jahrbuch für Kinderheilkunde, No. 4 and 5, vol. 94; Abstract, Journal of the American Medical Association, June 11, 1921, 76, 24.

² Read before Pediatrics Section of the New York Academy of Medicine, November 10, 1921.

duced through the steel needle into the abdominal cavity. Denzer states that even where there is only a few cubic centimeters of fluid in the peritoneal cavity that he has no difficulty in locating sufficient amounts for examination. Denzer does not believe there is any danger of puncturing the intestine except possibly in the presence of a plastic peritonitis when the intestines may be glued together. Abdominal puncture would doubtless be a great aid in helping us make a diagnosis of peritonitis or in excluding it in many of our doubtful cases. In infants particularly, it is often most difficult at times to exclude the possibility of peritonitis, especially pneumococcus peritonitis. Some of these cases begin suddenly with high fever, vomiting and symptoms of intestinal intoxication. Not infrequently these are Type I pneumococcus infections. If an early diagnosis could be made it is not unlikely that Type I pneumococcus serum might be beneficial. In the next issue of this volume, I shall be able to add more definite information regarding abdominal puncture.

The Relation Between the Child and Hospital Social Service. Chapin¹ makes a plea for shorter periods of hospital treatment with early discharge and closer observation at home. "As soon as acute symptoms of the disease have passed, they should be discharged. Otherwise, there is liable to be a recurrence of the original disease or, since this is a most susceptible period, a development of one of the many forms of communicable disease or varieties of cross infection. In the case of infants, a slow wasting often takes place without any objective symptoms, frequently ending in hypostatic pneumonia."

He presents figures showing that respiratory and intestinal diseases can be successfully cared for at home if good nursing can be secured. "If every infants' or children's hospital would thus reduce its inside work to a comparatively small unit, retaining its full medical and nursing staff to operate largely in the homes that supply the hospital, the best and most far-reaching results would be obtained, with the least expense. This would really constitute an enlarged and intensive form of hospital social service. The small inside service could be utilized for surgical operations, for severe illness requiring specialized nursing, and for scientific study of obscure cases demanding much laboratory service. In the few cases requiring hospital care, the stay would be short, as the corps of physicians and nurses would be available for speedy follow-up work after discharge. In this way, all possible benefits could be obtained from the hospital, without the disadvantages and dangers so often seen in the case of children. These efforts could be accomplished by an enlargement and a reorganization of the social service departments already in existence."

The present trend of those who are attached to hospitals treating infants is toward the Chapin idea. Shorter periods of hospital treatment with closer observation in the dispensary and more detailed home observation by visiting nurses. To accomplish this the dispensary must have as good an organization as the hospital and should have the

¹ Journal of the American Medical Association, July 23, 1921, No. 4, vol. 77.

same medical staff. If the child is under the control of the same physician both in the ward and in the out-patient service this can be accomplished. The same records should be used for both service and the same laboratory and x-ray facilities should be available for both. Frequently infants are admitted to the ward for laboratory examinations which could be done in the dispensary. It regularly happens that a child is admitted to the wards for a lumbar puncture and remains in the hospital for several days. The interne who has written a careful history and made a thorough physical examination is loath to discharge the patient within a day after admission. If the history, physical, etc., incorporated in the dispensary chart were used in the hospital, a second chart would be unnecessary. This would simplify the work of the interne and he would be more likely to discharge the patient as soon as the diagnoses was established.

A Case of Idiopathic Hemorrhagic Sarcoma of Kaposi. McLean¹ describes a case of idiopathic hemorrhagic sarcoma of Kaposi in a boy aged five and a half years and shows two photographs of the case which convey a clearer idea of the condition than an unlimited description. "In 1872, Kaposi brought to notice an unusual and remarkable affection of the skin which was characterized by the occurrence of deeply pigmented infiltrated areas and small tumors situated generally in the extremities and often followed after several years by visceral metastases and death." In this particular case the disease began as a small purple spot on the left cheek, this increased in size and shortly afterward the whole right cheek became swollen and discolored. Other spots appeared on the buttocks, hands, arms, legs, feet, and body. Eventually both cheeks became greatly swollen and hard and tense to the touch. There was a symmetrical deep purplish discoloration of the face, the lips were indurated and pigmented, the lower one being so indurated that the child was unable to close his mouth. The most striking change in the child was the rapid increase in the size of the cheeks. The normal contour of the face was almost obliterated by the two purplish symmetrical tumor masses. These masses projected beyond the tip of the nose. There was evidence of metastases in other organs. The child died less than eight months after the onset of the symptoms.

This disease is exceedingly uncommon in adults and very rare in children. There is apparently no treatment. This patient was transfused on several occasions without benefit resulting.

A Clinical and Radiographic Study of the Thymus in Infants. Blackfan and Little,² in an excellent clinical and radiographic study of the thymus in infants, have attempted to clear up some of our misconceptions relating to this much discussed gland. They found that dulness was determined most definitely and readily with the body in the horizontal position. The most marked change in dulness was produced by altering the position of the head. The dulness obtained with the head in semi-flexion disappeared completely on extreme dorsal flexion of the head. They made a number of percussion studies on infants under one year of

¹ American Journal of Diseases of Children, May, 1921, No. 5, vol. 21.

² Ibid., November, 1921, No. 5, vol. 22.

age. These infants were without thymic symptoms. The infants were afterward examined with the roentgen ray. These authors make a particular point about the position of the child on the table in order to insure a picture which is correctly centered. They state that "Correct position and technic is essential in making a roentgenogram to demonstrate the thymus. We have found that the thymic shadow may appear either to one side or the other by incorrectly centering the central ray or by failure to place and maintain the patient in the exact center of the plate." They found that the presence or absence of dulness in the second interspace to the right and left of the midsternal line was a guide in differentiating between a negative and positive thymus. A comparison of the roentgen-ray findings and the physical findings showed that 27 patients were negative both with the roentgen ray and on percussion; 4 patients were negative with the roentgen ray and positive on percussion; 9 patients were positive with the roentgen ray and negative on percussion. Among the positive cases they exposed a selected number to the roentgen ray. At the end of the week there was a distinct diminution in the size of the shadow. In a number of controls untreated there was no diminution in the size of the shadow. Most of us have attended society meetings in which roentgen ray pictures were shown of enlarged thymus in infants and children before and after roentgen ray treatment. The infants had a wide variety of symptoms which may or may not have been related to an enlarged thymus I have always been skeptical about the interpretation of these shadows, especially those which changed so rapidly after one or more exposures to the roentgen ray. Before these statements regarding the meaning of thymic shadows can be accepted there must be a great number of autopsy controls. Until someone presents a study of thymic shadows proven by autopsy, I shall not feel justified in telling my patients that thymic shadows mean thymus enlargement. Regarding the relation of thymus percussion to thymus enlargement I am not qualified to judge. I have never been able to satisfy myself that I could outline an enlarged thymus gland by percussion, yet I know several men with less clinical experience who can outline the thymus by percussion without the slightest difficulty.

The article by Blackfan and Little is a step in the right direction. They make no claim as yet but with further studies controlled by autopsy I feel confident they will do much to establish a more certain method of making a diagnosis of an enlarged thymus in infants.

Pericarditis in Children. Paynton¹ analyzes 100 fatal cases of suppurative pericarditis of which 84 per cent occurred in children under four years of age. Fifty-four cases were associated with empyema and 31 with pleurisy or pneumonia.

In only one instance did the condition occur as a solitary event.

This article is quoted for the sole purpose of reemphasizing the rarity of primary suppurative pericarditis in infants and children. I have recently encountered in my clinic an unusual case of congenital cardiac

¹ British Medical Journal, October 15, 1921, 2, 3172.

anomaly in which the diagnosis of suppurative pericarditis had been made because the extensive area of dulness on both side of the sternum, plus the fact that the apical impulse was in the fourth right interspace created this suspicion. Roentgen ray revealed the condition to be tremendous cardiac hypertrophy especially involving the right side of the heart and a pulmonary condition on the same side which was probably a compressed lung.

RHINOLOGY, LARYNGOLOGY AND OTOTOLOGY.

By GEORGE M. COATES, M.D.

Borderland Subjects. Shortly before the war, the profession in different parts of the country became interested in a desultory sort of way in what is now well known as "Group Medicine," the professed object being the association of a number of men representing different specialties in one "group" for the study of their private cases in order to insure every case an adequate examination at a minimum of expense—such an examination indeed as a free or "ward" patient obtains in a well-regulated, general hospital. It was felt that medicine had become so specialized that practically every case was in need of one or many consultations, which, to the patient of moderate means, meant bankruptcy. The group idea received great stimulus during the war from the close association of large numbers of men on the staffs of the various army and navy base hospitals, where the full value of coöperative study was realized as never before; where the medical attendant of a given patient could call for unlimited consultation in every branch of medicine and have unlimited laboratory examinations made for the mere asking. The value of such group practice to the patient was easily manifest and many groups have sprung up since the war. This has, in its turn, led to an increased interest among the members of our specialties in normal and pathological processes in other parts of the body than the head, and many have written on the so-called *Borderland* diseases. Indeed the ophtho-oto-rhino-laryngologist now claims the entire head as his domain by right of research work by members of these specialties; the diagnosis of intracranial lesions and their surgical treatment, plastic surgery of the face and jaws, the surgery of the neck, and indeed the internal surgery, at least, of the esophagus, trachea and bronchi. As we are not all ophthalmologists, however, the need of coöperative study in certain borderland conditions between eyes, nose and ears is manifest, as is a similar need of coöperation with the internist, the thoracic surgeon, the neurologist, the endocrinologist, the pathologist and the roentgenologist. After all, it is group study in one form or another that is the important thing.

Sluder¹ discusses some of the *problems needing the close coöperation of the neurologist and the ophthalmologist*, namely, the neuralgias and certain grave eye disorders. His paper was brought forth by the attacks of Cushing, commented upon last year, on alcohol injections and nasal operations for choked disk. The latter question will receive further consideration under discussion of sinus disease. Sluder says that a

¹ Journal of the American Medical Association, August 27, 1921.

certain number of cases of all neuralgias are atypical and that these violent pains in the head cannot be classified at present. For these reasons, a comparison of ideas should be helpful.

He says that typical lower-half headache, which Cushing calls "Sluder's neuralgia" may be produced in two ways: (1) From irritation of the nasal ganglion, and (2) from sphenoidal lesions irritating the nerves which supply that ganglion, *i. e.*, central to it (the maxillary nerve in the foramen rotundum and the Vidian in the Vidian canal). "Lower-half headache," when complete, is pain in and about the eye, the upper jaw and teeth, extending back about the zygoma into the temple, the ear and the mastoid, most usually 5 cm. back of the mastoid with tenderness to pressure, to the occiput, neck, shoulders, shoulder-blade, arm, forearm, hand and fingers, with often a sense of pepper or mustard burning in the nose. There are other manifestations, such as hydrorrhea, sneezing, nausea, vertigo, asthma, pain in the eyes, blepharospasm, etc., which may alternate but are seldom all seen at the same time.

This syndrome justifies the experimental cocaineization of the nasal ganglion, and, should this procedure relieve the symptoms, injection of alcohol will usually afford more or less complete relief, though subsequent injections may be necessary.

These lower-half headaches are quite distinct from true neuralgia of the trigeminus and more closely allied to the migraines. Cushing's objection to the intranasal injection of the nasal ganglion is based on the fear of hemorrhage, but Sluder thinks this is not well founded as in over 1000 injections hemorrhage only occurred 4 times and none of these was very difficult to control. Sluder says the choice of technic should be determined by the surgeon who is to use it and that the external route to the sphenopalatine ganglion is undoubtedly best for those not trained in rhinology.

Cushing's remarks on needless, and often fatal, ethmoidectomies for the relief of choked disk, were commented upon last year.¹ Sluder agrees that this criticism is well founded and that these cases are borderland cases and call for the utmost in coöperative study. There is manifest disagreement, however, with Cushing's statement that choked disk cannot be produced by sphenothmoiditis without intracranial pressure. Neurologists believe that choked disk can be produced *only* by intracranial pressure and that it is an edema of the disk produced by cerebrospinal fluid pressed out in the sheath of the optic nerve, but ophthalmologists recognize what is the same lesion and that it certainly arises from other causes as well. Hyperplastic sphenoiditis is one of these causes, and operation on the sphenoid frequently relieves the condition.

These problems are often so complicated that the utmost coöperation is needed to determine whether the cause of the blindness is intracranial pressure from brain tumor or some intranasal hyperplasia or infection. Neglect of either neurological or rhinological investigation is hazardous, and is often responsible for the unnecessary operations that are at times performed.

¹ PROGRESSIVE MEDICINE, March, 1921.

Sluder's conclusions are as follows:

"That choked disk is a lesion that seems to be of more than one origin, that the term describes a swelling of the nerve head and is not specific for its etiology; that the lesion secondary to postethmoidal-sphenoidal lesions is, in all probability, an optic neuritis; and that by the ophthalmoscope it may be indistinguishable from that produced by intracranial lesions."

The question has often been asked, "Why do I not see those nasal ganglion cases which are, in your experience, not infrequent?" The explanation, Sluder thinks, lies in the fact that neurologists are rather likely to be satisfied with a diagnosis of neurasthenia; and rhinologists at present are prone to declare the nose negative that does not show a frank sinus suppuration. The dermatologist recognizes many skin lesions that are not suppurative. His philosophy and methods come into service in these nasal diagnosis.

In 1920, the American Laryngological, Rhinological and Otological Society held a symposium on "Borderland" subjects.

Yankauer,¹ referring to *diseases of the lungs and bronchi successfully investigated by the rhinologist* (bronchoscopist), says that "primarily, bronchoscopy was reserved for the removal of foreign bodies, but it has now a much wider field of usefulness. Bronchoscopy is not only indispensable for the diagnosis of obscure pulmonary lesions, but indications for thoracic surgery can be determined with more accuracy by bronchoscopy than by any other means. Soon the bronchoscope will have the same relation to diagnosis of the diseases of the lungs, as cystoscopy has to diseases of the bladder. Diagnostically tumors and foreign bodies in the lungs have been discovered, and in addition bronchoscopy has therapeutic uses.

Among diseases hitherto considered outside the scope of laryngology, and which has been grouped among general infections, is *whooping cough*. This is strictly a localized infection, characterized by redness and swelling of the larynx. The severity of the disease is in direct proportion to the severity of the local lesion. The disease affects young children with particular severity. The complications often cause death. Antipyrin is a drug which Holt and others have found almost specific in the treatment of whooping cough. This is on account of its antiseptic and mild local anesthetic action. The author conceived the idea of making injections of a 4 per cent solution of antipyrin directly upon the vocal cords, by the method of direct laryngoscopy. The results of this treatment are highly satisfactory, often aborting the disease with a single treatment. If the disease is not entirely aborted, the number and severity of the paroxysms is greatly diminished and the resulting complications eliminated. The injections should be made quickly and skillfully, preferably by a skilled laryngologist."

Lynah² finds that many borderland problems confront the esophagoscopist, though in his opinion, it will be only a matter of a short time

¹ Transactions of American Laryngological, Rhinological and Otological Society, 1920.

² Ibid.

when all of the other methods of treatment applied to disease of the esophagus "in the dark" will be superseded by esophagoscopy.

The chief symptom for which patients come for relief is difficulty in swallowing, due either to a spasm or to mechanical obstructions. Normal spasm of the esophagus is present in all cases when examined with the esophagoscope, but, when it becomes excessive, it is termed esophagismus. This is usually encountered in neurotic subjects and those having evidence of hypothyroidism. These cases, and even those with ulcerations or strictures are often labelled "hysterics" and coöperative study of the whole body is necessary to solve the problem. To distinguish cardio-esophagismus from malignant disease of the esophagus is one of the borderland problems in diagnosis. The diagnosis is best made by means of ocular guidance, gastric analysis and a careful study of the symptomatology and the roentgenographic plates. Many cases of malignant disease are taken for neurotic esophagismus and called "pure neurotics" owing to an insufficient coöperative study.

Loeb and Weiner find that the otolaryngologist and the ophthalmologist must work in close coöperation in the study and treatment not only of the major, but also of the minor, lesions of the eye. The following conclusions have been forced upon them by their united experience:

1. Lesions of the eye and its adnexa occur far more frequently from pathological processes involving the nose and paranasal sinuses than is generally accepted.

2. A study of the minor processes would result in a more fruitful yield than that which has followed the interest in the exceptional and striking cases manifested up to the present time.

3. It is necessary to examine and to study in detail the nose and paranasal sinuses in all eye conditions for which they may be responsible, including conjunctivitis, lacrimal sac conditions, orbital cellulitis and abscess, corneal ulceration, iritis and its associates, maturing cataract, retinal hemorrhage, retinal detachment, optic neuritis (ocular and retrobulbar), optic atrophy, glaucoma, reduction of vision, and diminution of the field of functional disturbances not otherwise explained.

4. It is most important to examine for and record any changes in the orbital and ocular tissues in all cases of acute or chronic suppurative processes involving the paranasal sinuses.

5. Persistent and intelligent study along these lines must bring about a solution of many of the vexing problems which have been uncovered by the casual study of the relation between the eye and the upper respiratory tract.

Disease processes extend from the nose, throat and ear to the eye:

1. By extension along the mucosa (especially that involving the naso-lacrimal tract and the conjunctiva).

2. By pressure, as when the orbital wall is invaded by a mucocele or other process which bulges out a sinus wall.

3. By extension through dehiscences, mainly in the production of orbital cellulitis and abscess.

4. By destruction or necrosis of the boundary walls.

5. By periostitis of the orbital bony wall supervening upon a perios-

titis of the sinus wall by direct invasion or through the bone vascular systems.

6. By the vascular and lymphatic systems:

(a) Thrombophlebitis of the cavernous sinus, the ophthalmic vein and other vessels.

(b) Obstruction of the circulation, such as edema of the eyelids, chemosis, exophthalmos; and even swelling of the papilla and optic neuritis.

(c) Where the vessels are merely the transmitting agent (as when the tonsil is the cause of an iritis).

7. By the nervous systems:

(a) Cases due to pressure, either extraneous or from inflammation within the nerve sheath and trophic disturbances. These include optic neuritis, optic atrophy, paralysis of the ocular muscles and of accommodation. Abducens paralysis may result from a localized meningitis, occurring in connection with a suppurative otitis media.

(b) Cases which, for want of a better pathological understanding, are called reflex, functional, etc.

The numerous cases of blindness from optic neuritis relieved by nasal operation leave no doubt that there are many minor defects of vision which are dependent on nasal lesions and for which no relief is possible except through proper attention to the nose and paranasal sinuses.

The *Relation of the Endocrine System to Nose, Throat and Ear Diseases* is indicated by Forbes¹ who believes that all goiter cases should be tracheoscoped before operation to determine the amount of pressure on the wind-pipe. Much pressure is an additional indication for surgical interference. Acute tonsillitis is frequently followed by sudden enlargement of the thyroid, and in this respect both faucial and lingual tonsils should be investigated. Acute thyroiditis on the other hand often causes disturbances of speech, hoarseness and dyspnea, as well as troublesome cough, which is often the first symptom of incipient thyroid disease. It seems probable that vasomotor disturbances of the air passages are caused by endocrine disturbance, and it is beginning to be believed, as quoted from Selfridge² last year, that endocrine dysfunction is probably the cause of sensitization in hayfever, asthma and allied conditions.

We are all familiar, at least by hearsay, of those cases of status lymphaticus due to persistent thymus, where the patient succumbs suddenly to the anesthetic, either general or local. Forbes thinks these patients are subject to attacks of lymphotoxemia and that during these attacks are especially liable to the effects of bacterial and chemical poison, due to a hyperthymization of the system. The diagnosis of a persistent thymus gland can usually be corroborated by the x-ray.

Etiology of Acute Infections. Laboratory studies by Mudd, Grant and Goldman³ lead them to the general conclusion that sudden or prolonged chilling of the body plays an important part in the process of "catching

¹ Transactions of American Laryngological, Rhinological and Otological Society, 1920.

² PROGRESSIVE MEDICINE, March, 1921.

³ Annals of Otology, Rhinology and Laryngology, March, 1921.

cold." This is, of course, simply a scientific confirmation of the conclusions reached clinically many years ago by both physician and layman the world over. They state that it is a fact beyond question that potentially pathogenic bacteria may lead a saprophytic existence upon the pharyngeal and tonsillar mucous membranes of healthy subjects and that these same bacteria may, under appropriate circumstances, become the active agents of infection, local or generalized. Exposure to cold is considered to be one exciting factor, as they have shown experimentally that chilling of the body surface causes a reflex vasoconstriction and ischemia in the mucous membranes of the nasal cavity, postnasal space, oropharynx, palate and tonsils. They offer the hypothesis that this ischemia may be the mechanism by which local resistance is lowered and infection excited. Jonathan Wright has said that "owing to the fact that wet feet and chilling of distant regions of the surface of the body are, at least in clinical experience, quite as frequently followed by coryza and sore throat as the direct impact of such external influences upon the head and neck, we have the right to infer that the shock at the surface must be transferred to internal nerve ganglia and there translated into impulses which are carried to the surfaces of the mucosa of the upper air passages. There they give rise to the chain of biophysical and biochemical changes which may simply result in a mild coryza or in catarrhal pharyngitis, the resolution of which terminates the chain, or these conditions may be in themselves the starting point of bacterial invasion."

Mudd, and others, think it not improbable that the ischemia incident to cutaneous chilling, by decreasing cell respiration, or by retarding removal of the products of cell metabolism, or by increasing the permeability of the epithelial cell surfaces to the bacterial products, or by decreasing the local supply of specific antibodies, or by altering the media in the tonsillar crypts and folds of the mucous membrane in which the bacteria are living, or by altering the state of aggregation of the colloids of the protoplasm, might thus so disturb the equilibrium between host and parasite as to excite infection.

Another mechanism that may be responsible for "cold catching" is that of Hill and Muecke. They found that in hot, moist, crowded rooms, the mucous membranes over the turbinates and septum swell, become turgid with blood and tissue lymph and covered with a thick secretion. In such crowded places massive droplet infection is likely to occur. Then, on going into the cold, outer air, the bloodvessels constrict and the nasal mucous membrane is chilled but remains swollen with tissue lymph, which seems a suitable condition for bacterial proliferation.

While excessive chilling of the body surface may have the ill effects suggested above, the collaborators do not wish to encourage unreasoning fear of draughts and exposure. Good ventilation and circulating air in buildings, cold weather and out-of-door living are needed for vigorous health, and many people are unquestionably benefited by cold bathing. Excess, however, should be avoided, and individual susceptibilities should also be remembered. Thin, anemic and delicate persons can,

in general, stand less exposure than stocky, full-blooded ones. The reason "colds" usually become prevalent with the onset of cold weather is that people then give up the out-of-door life, live in overheated houses or offices, and are therefore subjected to the chance of excitation of auto-infection by prolonged or excessive chilling, while the close, hot atmosphere of public conveyances and meeting places renders the mucous membranes more susceptible to massive droplet infection. As bacteria gain foothold and multiply, it is reasonable to believe that they tend to increase in virulence and so add another factor to the general tendency to increased prevalence of respiratory infection. This process is reversed with the return of milder weather and out-of-door life.

To avoid these infections, it is essential to lead a vigorous and healthful life with adequate sleep, food, exercise and fresh air. Bathe daily and keep the house sufficiently warm to be comfortable, but not over-hot or over-dry. Avoid contagion and excessive irritation of the mucous membrane from tobacco, etc. Avoid crowded places and see that the nasal passages are free from chronic infectious processes and abnormalities. Some degree of "hardening" to exposure, graded and adapted to the needs of the individual, is possible and often of the greatest service.

The authors believe that the filterable virus of Kruse and Foster, commented upon in PROGRESSIVE MEDICINE in March, 1917 is responsible for a type of coryza that is a clinical entity. This virus is of relatively high virulence and may cause infection practically independently of the action of exciting factors.

An explanation of the *action of menthol and peppermint in aiding ventilation of blocked nasal passages* in acute rhinitis is offered by McGuigan.¹ The relief afforded is well known to profession and laity alike. During some stage of the rhinitis there is an increase of relatively thick mucous material poured into the nasal passages, the walls of which are swollen and tend to adhere, thus preventing the passage of air. Relief can be gained in only two ways: Either removal of the obstructing material, or by changing its form so as to allow air to enter. Menthol changes the physical state of the mucus. It is not an astringent. It is believed that the mucoid material is a foam-like consistency, and laboratory experiments have demonstrated that menthol and peppermint, in solution, rapidly destroy foam. Surface viscosity holds the foam or bubble-like structures together, while surface tension tends to break the bubbles, and this action of menthol is due to changes in the surface viscosity of the mucus and on the membranes producing the exudate.

VINCENT'S ANGINA, particularly in the form of trench mouth as seen in the army, is commented upon by Rickard and Baker.² It occurred in considerable numbers among our own troops, both in home camps and more particularly in the A. E. F., where close contact in quarters or in the trenches, with its incident exposure, was conducive to infection. In the majority of cases the diagnosis can be made from the clinical appearance alone, but a direct smear should always be stained and

¹ Journal of the American Medical Association, January 29, 1921.

² Ibid., December 11, 1920.

examined, and the possible presence of coexisting diphtheria and syphilis must never be forgotten.

The chief clinical features are:

(1) Slight constitutional disturbance; (2) temperature rarely over 100° F.; (3) pain on swallowing; (4) submaxillary lymphatic glands enlarged and tender; (5) disease often unilateral; (6) membranous exudate usually easily removed, leaving a raw, bleeding surface; (7) urine rarely albuminous, and (8) presence of the fusiform bacilli and spirochetes.

For treatment, nothing has been found so satisfactory as the use of arsphenamine locally in the form of a 10 per cent solution in glycerin, or, for practical purposes, 0.6 gm. of arsphenamine dissolved in 2 fluid drams of glycerin. This preparation is considered stable. The parts to be treated should be carefully cleansed and dried, and the arsphenamine solution thoroughly rubbed into the tissues with a cotton swab. Treatment is given twice a day, and results appear quickly, especially in those painful cases where the gums are primarily involved.

Chromic acid in 2 per cent solution also gives good results, and I have found that when neither of these could be obtained in the A. E. F. that pure carbolic acid applied in the same way was a quite satisfactory substitute.

Conclusions. 1. It seems to be definitely proved that the fusiform bacillus and the accompanying spirochete are one and the same, the latter being an evolutionary form of the former but always present with the bacillus.

2. The author believes that Vincent's angina is much more common than is at present realized, and that it is not recognized because of the failure to take a smear, and that furthermore it is frequently mistaken for diphtheria and syphilitic ulcers.

3. It is also probable that the considerable use of candy or proteins with the subsequent lack of oral cleanliness predisposes markedly to this infection; likewise, that poor teeth harbor the organism and that it will manifest itself in its characteristic lesions whenever a suitable opportunity is given. It seems to be more frequent during the winter months.

4. The use of arsphenamine dissolved in glycerin is strongly advised in the treatment of Vincent's angina and infections in which the fusiform bacilli and spirochetes resembling Vincent's organism are found.

Cases of INCIPIENT HYPERTHYROIDISM frequently come to the laryngologist complaining of catarrh, or constant colds, or some vague throat condition, when, thinks Hubert,¹ a close study reveals increased stimulation of the thyroid gland. It is of the greatest importance to recognize these patients with early signs of over-activity of this gland, because if detected early, the diseased condition yields to appropriate treatment.

These patients usually characterize the throat discomfort complained of as a choking sensation. They catch cold easily, are of a nervous temperament and have palpitation of the heart on exertion. Most of them have badly infected tonsils, and foci in the teeth, sinuses, intestinal

¹ Laryngoscope, August, 1921.

and gastro-urinary systems must not be overlooked. There is often a tremor of the tongue, and also of the fingers. The thyroid may be slightly enlarged.

The adrenalin test is sufficient to make the diagnosis. One-half cc of adrenalin hydrochloride, 1 to 1000 solution, is injected intramuscularly. A positive reaction is obtained in a few minutes in a hyperthyroid case. This consists in an exaggeration of the symptoms present and other latent symptoms are usually brought out. There is an increase in pulse-rate of from 10 to 30 beats a minute, and a rise in blood-pressure. Nervousness is increased, as is also the tremor, and sometimes there is a dilatation of the pupils.

The first principal of treatment is to eliminate all possible foci of infection, by operation if necessary. As these patients suffer from hyperirritability of the sympathetic nervous system and as quinine hydrobromate is a sympathetic depressant, the administration of this drug in 5-grain doses three times a day, gives an almost specific action in the early cases.

There is no doubt that these patients are of the sympathetic type, and that the symptoms of vagatonia do not appear except later in the disease or in the fulminating types of hyperthyroidism.

Operations for Drainage of the Lacrimal Sac. Last year in PROGRESSIVE MEDICINE, the Mosher and the Sauer-Weiner intranasal operation on the lacrimal sac were given in some detail. While most of these procedures have much in common, there are differences in technic that affect the ease with which they are performed and to a certain extent the after-results. McCready¹ says that opening of the sac intranasally is indicated in any chronic inflammation of the sac, caused in most cases by one or more strictures of the naso-lacrimal duct. It is contra-indicated in acute inflammation of the lacrimal sac. Epiphora, caused by stricture in the canaliculus, will not be benefited by this operation.

The method advocated by McCready is as follows; A probe is passed through the inferior punctum, canaliculus and sac into the duct as far as it will go. A rectangular flap is cut through the mucoperichondrium with its upper border above the superior part of the anterior end of the middle turbinate, its lower border just above the attachment of the inferior turbinate, these being connected anteriorly by a vertical incision. This flap is elevated from the bone and tucked out of the way beneath the middle turbinate. With a long chisel, an opening, about three-eighths of an inch in diameter, is made anterior to the upper portion of the middle turbinate. The probe being withdrawn until the end is opposite this opening, it is now pressed inward causing the sac to bulge into the opening. This bulge is seized with forceps and removed with scissors or knife, allowing the probe to pass into the nose. A corresponding window is made in the flap which is now packed back into position. Success or failure in this operation is said to depend largely upon the after-treatment, which consists in keeping the nose free from crusts and keeping granulations down with silver or acid. The sac,

¹ Pennsylvania Medical Journal, April, 1921.

also, should be flushed every few days until healing takes place, usually in about four weeks. Nothing is said about the continued sound passing which Mosher admitted was necessary in his operation. On the whole, this method resembles that of Sauer and Weiner but is a little more complicated owing to the formation of a flap which these latter operators do not consider necessary.

Chamberlin¹ has described a very similar operation which is, after all, that of West with certain differences of technic; and Bookwalter² has operated upon 55 cases with excellent results. Six of these required some after-treatment with punch or cautery to destroy granulations and maintain an opening. The latter operator employs a flap endonasal operation similar to that described above, but Walker³ thinks the formation of a mucoperichondrial flap cumbersome and unnecessary. The essential point in his technic is the formation of a *circular* opening in the sac and bony nasal wall of the greatest possible diameter, and he employs a 7 mm. spherical burr for this purpose. A round perforation with smooth margins is thus produced. It should be possible to obtain 80 per cent of cures by this or any other standard method, and it should not be necessary to do sac extirpation as formerly. The fact that an external scar is avoided and that only local anesthesia is required are two elements of sufficient importance to decide upon an endonasal fistula operation.

Mosher,⁴ after having given us a successful endonasal operation⁵ devised on a sound anatomical basis, has abandoned this in favor of what he calls the Mosher-Toti combined operation for the following reasons: The infection of the sac is cured and the epiphora done away with. In over 20 operations there has been no orbital infection, whereas in 1 case where the endonasal operation was done, the orbit was infected and the eye nearly lost. Great relief is experienced by working by sight instead of working in the dark and greater safety is assured.

The operation here described differs from that of Toti in that no attempt is made to join the lacrimal sac to the nasal mucous membrane by making equal and opposite openings in each and anastomizing them by sutures. Toti preserves the sac as a sac, but the objection to this is that the new opening into the nose may narrow in time as most anastomotic openings do. What Mosher does is to destroy the sac as a sac, preserving only the essential part of it—namely, the outer wall and the punctum. He proceeds to operate as follows:

The anterior end of the middle turbinate is removed. The lacrimal sac is exposed by a skin incision which lies about 6 mm. from the inner canthus of the eye and is very similar to the incision used for excision of the sac except that it is a little longer. The periosteum of the inner wall of the orbit is elevated to beyond the crest of the lacrimal bone after exposing the sac by working beneath the periosteum from above downward. The sac is now made free and turned outward until the

¹ Transactions of American Laryngological, Rhinological and Otological Society, 1920.

² Archives of Ophthalmology, November, 1920.

³ Ibid.

⁴ Laryngoscope, May, 1921.

⁵ PROGRESSIVE MEDICINE, March, 1921.

beginning of the nasal duct is clearly seen. Now the lacrimal bone in front of the crest is broken down by knife or chisel, a punch is introduced and the remaining lacrimal bone in front of the crest is bitten away, as well as the posterior edge of the ascending process of the superior maxilla, where it makes the anterior half of the bed of the sac. This makes a bony opening into the nose at least equaling the height and width of the sac. The inner wall of the nasal duct is also bitten away to the level of the upper rim of the inferior turbinate. Following this, the inner half of the lacrimal sac is removed, and also the inner wall of the soft tissues of the nasal duct, with scissors and conchotome. The outer wall of the sac must be preserved as in this the common punctum is placed. In distended sacs this is never endangered but in small sacs, great care must be exercised. The mucous membrane of the nose which presents in the bony opening is sacrificed and trimmed flush with the margins. The resulting scar is negligible compared with the greater safety of this form of operation.

THE NOSE.

External Deformities of the Nose. Whitham¹ reduces old deforming fractures of the nose by the Morley Marshall method, and retains the nose in position by a splint of his own devising. The operation is done under light ether anesthesia, an incision three-eighths of an inch in length being made in an oblique direction just below the junction of the nasal bone with the nasal process of the superior maxilla on each side. These incisions extend to the bone. A small straight chisel is used to cut through the nasal process of the superior maxilla on each side but care must be exercised not to enter the nasal cavity. The nose is then grasped at the bridge and pushed forcibly right and left until freely mobilized. To completely accomplish this, it is sometimes necessary to place a pad on the side of the nose and tap sharply with a hammer (Marshall uses a piece of lead covered with soft leather in place of the pad—Ed.). The incisions are now closed with a single suture and in some instances this is all that is required. Where the resilience remaining in the cartilagenous and bony nasal septum keeps the nose inclined in the direction of the original deformity, an external splint is necessary. Marshall uses many thicknesses of gauze soaked liberally in collodion and molded over the nose until hard, but Whitham employs an external splint consisting of a curved wire attached to a horizontal bar which is cemented to the upper teeth. The proper degree of pressure on the deformity can be regulated by the use of felt pads and bending the wire loop. This splint is retained for seven days, when the nose will be firmly fixed in its new position, and it is said to be very comfortable, immovable and never out of adjustment.

Selfridge² says that for the sake of safety (presumably to the operator) it is his custom in all cosmetic surgery of the nose to tell the patient that from *one to three* sittings may be required before the operation is complete;

¹ Laryngoscope, August, 1921.

² Ibid., June, 1921.

that it is far easier to overdo such a procedure and that an underdone job is far more easily corrected.

In using grafts he tells the patient that "occasionally they become infected and have to be removed and another attempt made," and that there are chances of infection in the area from which the graft is removed even if done under the most perfect asepsis.

If treating *rhinophyma*, believing that the epithelial lining of the sebaceous ducts extends to the bottom of the ducts—practically to the fibrous tissue covering the cartilaginous framework of the nose—he simply trims the hypertrophied tissue away with a large, sharp knife until the desired size and shape is attained. This is done after thorough cleansing with gasoline and iodine followed by liberal injections of 2 per cent novocaine and adrenalin. The nose is covered with a gauze dressing wet with aceto-tartrate of aluminum for twenty-four hours, and after that with scarlet red ointment. In seven days the new skin has completely reformed.

Selfridge has abandoned Carter's method of dissecting out the entire thickness of the rib for *dorsum grafts* because of the danger of perforation of the pleura. He has also given up the use of a tibia graft on account of the resulting scar. The method of Lee Cohen¹ of cutting portions of the rib with special chisels is the one that has given him the greatest satisfaction, except when sufficient cartilage can be obtained from the septum.

Plastic Surgery of the Face. Out of his experience with war injuries, Imre² has developed certain new principals in plastic surgery of the face. The method has proved highly successful in cases of new growths of the eyelids as well as in destructive injuries of other parts of the face. It is an attempt to cover the skin defect from the immediate neighborhood of the defect without any real pedunculated flap. In order to be able to slide the greatest quantity of skin with the shortest possible open wound, we must naturally utilize a curved cut and slide the tissue used for covering the defect "in a bow."

Figs. 1 and 2 illustrate the application of this principal in its relation to injuries of the eyelids. The method is quite simple when once understood, but is not practicable in every case. The curved incision should have the form of a quarter ellipse and be about four times as large as the necessary sliding. At each end a small triangle of skin should be removed to make the sliding process more easy as well as to avoid wrinkling. It is of the utmost importance that extensive undermining of the skin be accomplished and that it be freely mobilized. Where there is a defect of great depth to be filled in, fat and fascia pedunculated grafts are employed, and in all cases where possible, cat-gut retention sutures are a great help in fixing the flap in its new place. The accompanying figures give an idea of the result and manner of attainment.

Ferris Smith³ disputes the soundness of the practice of cutting free,

¹ PROGRESSIVE MEDICINE, March, 1921.

² Journal of the American Medical Association, May 7, 1921.

³ Ibid., December 4, 1920.

full thickness, grafts larger than the size of the area to be covered. He says that: "The success of any graft depends largely on its even application in a state of normal skin tension. A gentle pressure should be evenly maintained to prevent the collection of any exudates and

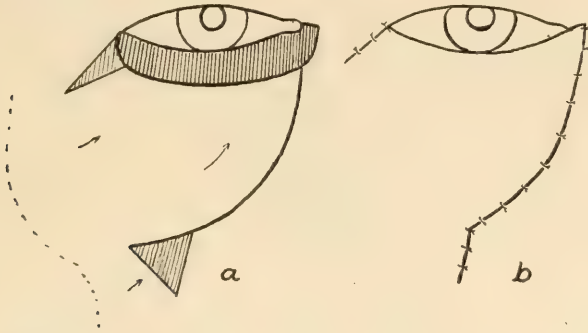


FIG. 1.—The arrows show the manner in which the flaps were slid. (Imre.)

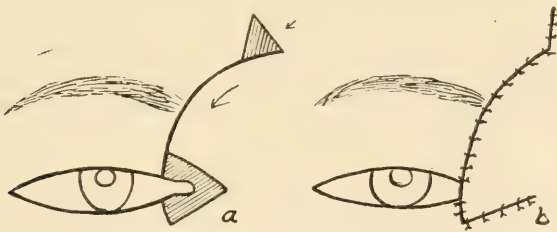


FIG. 2.—A single sliding flap served for this purpose. (Imre.)



FIG. 3 (Case 12).—Appearance of patient before and after operation. (Imre.)

insure the proper nourishment of the graft. Thiersch grafts do not include elastic fibers—the skin maintains its normal tension—and such grafts grow well even in the presence of oral secretions and pus when these points are observed. These are the essentials of success in the

Esser method. A full thickness graft must live by absorption of lymphatic and serous secretions until it becomes part of the local vascular system. If it is cut larger than the required size and its elastic fibers are allowed to contract it, the opportunity for absorption of nourishment is greatly diminished. Cut such a graft exactly to pattern, suture it accurately, maintain a light, even pressure, and success will usually reward the effort. The same plan applies to skin flaps."



FIG. 4.—Exterior sliding flaps to cover fat tissue which was made to form a foundation for the aperture, the fat being slid from inside the cheek. (Imre.)

Smith divides the use of plastic flaps into three main types and recognizes the necessity of covering raw surfaces in the repair of cavities and the use of autogenous supporting surfaces. The essentials of success are sound surgical training, a proper temperament, imagination, courage and tenacity. The three general methods which cover all types of plastic operations on soft parts are briefly reviewed and criticized. They are as follows:

"A. 'French Method.' This consists of sliding or stretching of the flap with little twisting or torsion of the pedicle, and is widely used alone or combined with other types for repair in all parts of the body. The essential characteristic is masking a loss of substance. It should never be used in large partial or total losses of the nose, because rapid flattening and deformity result. Its use in repair of a cavity always demands a lining of mucous membrane or skin.

"B. Interpolation. 1. Flaps from the immediate neighborhood, either single or double with a pedicle which is rotated, twisted, bridged or tunneled. This is the Indian mutilation type of flap. The pure Indian flap was raised from the forehead, rotated on a pedicle and used without lining for nasal repair. This flap is the method of choice for nasal covering and the method of necessity in covering large losses of the cheeks and lips.

"2. Flaps from a distance with a tubed pedicle. Tubing of the pedicle is a valuable modification by Major Gillies. This consists in suturing the raw edges of a long pedicle, thus doing away with danger of infection by including the raw surface and furnishing a certain blood supply to a flap at its distal end. Perthe's method of outlining, dissecting and resuturing the flap in its original bed is usually combined with this procedure.

"3. Free flaps or grafts. These may be skin, fat, fascia, bone or cartilage.

"4. Flaps transferred on a 'carrier' usually the arm. This is essentially the 'Italian method,' which was primarily proposed for rhinoplasty. It consists in fashioning a pedicle on the arm and later transferring it to the nose with the arm immobilized on the head until a new blood supply is established."

In the light of present knowledge, the method has nothing to recommend it in facial repair, and many things to condemn it. The position is torture to the patient, there is danger of emboli in the superficial veins of the arm, infection readily occurs from contact with the nose, and dressings are difficult. Its supporters can only claim that it prevents scarring of the forehead. This is offset by the fact that the texture of the skin is such that its contrast with the face and scalp is very marked.

If forehead skin is not available, chest skin should be supplied by use of Gillies' tubed pedicle.

"C. Retrenchment. This covers operations for reduction of excess tissue and production of a more pleasing cosmetic result.

"On the whole, cartilage forms the best supporting substance. Free plants of bone, with or without periosteum, are slowly absorbed, even when turned with a flap but unattached to other functioning bone. Under this last condition, it is so difficult to shape or handle as practically to exclude it. While cartilage has no bloodvessels it lives easily by lymph absorption and probably even grows when the perichondrium remains attached. The cartilage of choice for most requirements is that of the seventh and eighth ribs. There is an ample supply, it is easily available and it is readily modeled. It does not unite with bone but is held in place by fibrous adhesions. Fat is only of value in filling small depressions. It should be planted in a single sheet if possible, in excess of requirements and lightly sutured to its bed. Foreign bodies are only exceptionally retained by the body tissues and gangrene, skin atrophy or expulsion is the usual experience."

Roy¹ employs with success *fat grafts* for the cure of superficial cicatrices of the face. Such deformities as are caused by loss of substance of the malar bone, the orbital ridge or the anterior wall of the frontal sinuses need bony or cartilaginous grafts since fat will not unite with bone and is not firm enough. Nothing can, of course, be done in the way of restoration until the original wound has become healed and sterilized. In correcting depressions in the soft tissues, the cicatrix is first thoroughly removed and the skin liberated to beyond the edges of the depression. Complete hemostasis is necessary. Fat is taken from the thigh or buttock slightly in excess of the amount needed to fill the depression, since fat will shrink. The graft is placed at once into the prepared cavity and the edges of the wound accurately sutured. Slight compression of the dressings, such as supplied by an elastic band, will hasten the diminution of the graft and its incorporation with the surrounding tissues, as well as aid in giving it the requisite hardness.

¹ Laryngoscope, February, 1921.

Beck¹ deplores the cosmetic results obtained on most of the cases he has seen; cases operated upon in the various important centers of plastic surgery both here and abroad. He states, from his observation of ex-service men, that the work done upon them in the majority of instances showed evidence of complete ignorance of the principals underlying plastic surgery. This is discouraging since from the published photographs of results obtained we get the idea that most of those cases have been marvelously transformed from horribly and disgustingly disfigured beings into at least the semblance of ordinary humans. I am optimistic enough, from my small experience, to believe that the case against the plastic surgeons may have been overstated.

The Septum. Craig² offers a nasal procedure in children that may, in some cases, obviate the employment of the orthodontist. A submucous resection was done on a child aged ten years for a septal deformity caused by a fall four years previously. There was a high arched palate and the upper front teeth were irregular. In six months time, the nose was in perfect condition and the teeth regular. The removal of the vomer and the stimulus of mastication had accomplished this result. The author now suggests, having tried the method out on a few patients, that in cases of great irregularity of the upper teeth, the vomer should be cut through from before backward, separating it almost entirely from the maxillary ridge, thus weakening the center of the palate arch and leaving the rest to Nature. These cases should, of course, be kept under constant observation by a dentist.

The submucous operation is also recommended by Oertel³ for the correction of external deviations of the anterior portion of the nose. It is of those cases where there is nasal obstruction due to an anterior cartilaginous deflection of the septum and a marked deviation of the external nose that he writes.

The procedure consists in making the preliminary incision at least 15 mm. posterior to the tip of the cartilage and elevating forward as well as backward so as to form an anterior pocket. The cartilage of the tip is now cut at its base so that it swings free, being only attached above and to the mucous membrane of the opposite side. Having removed what cartilage and bone is necessary posteriorly to make the septum straight, the nose is now found to be freely movable at the tip and may easily be placed in the median line. If the cartilage left at the tip is much curled or cupped, it must be freely incised in such directions as to flatten it. A strip of thin, straight bone is now taken from the perpendicular plate of the ethmoid and placed beside the mobilized cartilage of the tip in the pocket of mucous membrane and extending posteriorly between the two layers of free muco-perichondrium. The incision is closed with sutures and the nose lightly packed with gauze inside a rubber finger cot. The mobilized and stiffened nose must be held in position by a splint made of dental modelling wax attached with adhesive straps.

¹ Laryngoscope, July, 1921.

² Ibid., February, 1921.

³ Annals of Otolaryngology, Rhinology and Laryngology, March, 1921.

While the above-quoted author does a submucous operation to correct external nasal deformities, Carter finds that similar deformities are frequently produced by this same corrective procedure. While the septum plays little part as a support in the preservation of the contour of the adult nose, it probably has a most important part in nasal development and therefore should not be molested during the years of most active growth. This is not in accord with the findings of the Royal Infirmary of Edinburgh commented upon in *PROGRESSIVE MEDICINE* a few years ago, where it was found that the removal of the septum in children of ten years of age did not interfere with the normal nasal development. My own experience coincides with that of the Scotch clinic, but it is usually deemed wise, nevertheless, to defer operation where feasible. Carter recommends as a substitute that the submucous elevation of both sides be made in the usual way except that the incision be made through the whole length of the muco-cutaneous junction and across the floor of the nose. Through this incision, after the elevation, the cartilage is reduced by the aid of special knives, to a vertical plane and then splinted in place. No saddle-back deformities should follow this procedure, but then I do not think that they are frequent sequelæ of the submucous operations as done by the average operator.

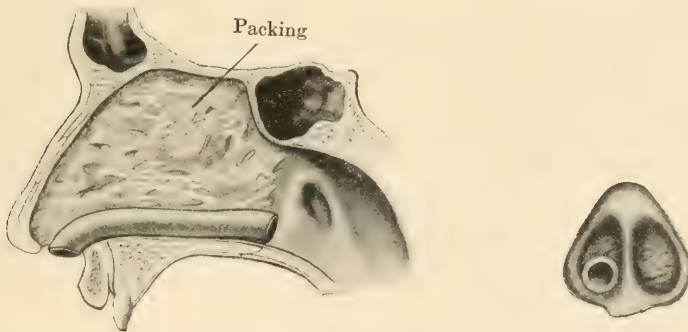


FIG. 5.—Tube, with packing above it. (Goodyear.)

Packing the nose with gauze in which is incorporated a rubber drainage tube for ventilation is highly recommended by Goodyear¹ to relieve the patient from the great and undoubted discomfort of compulsory mouth breathing for the first twelve to twenty-four hours after operation. Dispensing with all packing accomplishes the same result but has never become popular due to hemorrhage, hematoma and separation of the flaps. The method advocated here is simply to place a soft-rubber, thin-walled tube with a caliber of one-quarter inch and about two and a half inches in length, on the floor of the nostril opposite to the primary incision, and pack the nose with gauze in the usual manner. I have myself used this method for several years but have found it best to stitch the end of the tube to the gauze packing to prevent it from slipping either in or out. The tube can be cleaned if it becomes obstructed, and

¹ Journal of the American Medical Association, October 1, 1921.

its use undoubtedly affords the greatest comfort to the patient. In exceptional cases, I have used a tube in each side with gratifying results.

SEPTAL PERFORATION FROM ARSENOUS ACID. Dunlap¹ says that arsenous acid causes septal perforation and an associated pathological condition of the skin, throat, and eyes within six months of continuous exposure, and that neither race nor age offer any protection.

Arsenous acid is a valuable by-product of copper ore smelting and many workers come into contact with tons of the pure product daily. Treatment consists in resection of cartilage in the larger perforations thus allowing mucosa to mucosa approximation, plastic closure of small perforations, or the use of an obturator to relieve the objectionable crusting.

The arsenic dust is breathed into the nose and with the moisture there encountered, forms arsenous acid which quickly causes necrosis of the septal mucosa at Kisselbach's area. Protection with a camphor-menthol-petrolatum mixture on cotton, will prevent this condition from developing or will cure it if in the early stages but it is difficult to get the workers to cooperate. When perforation has occurred, the cartilage is flush with the mucosa of each side; the edges of the latter are much swollen, gray, sloping, edematous and everted. It is also separated from the cartilage as though elevated mechanically. The cartilage edges also become thicker than normal, so that there is often marked anterior obstruction which is further increased by the hard crusts which form around the margin. Spontaneous cure of the crusting results when the cartilage near the perforation, being separated or only loosely in contact with the mucosa, disappears by necrosis and mucosa to mucosa approximation, with healing of the edges, takes place. Then only a large perforation with no discomfort, crusting or symptoms remains. The cartilage anterior to the perforation thins out by absorption in a few weeks but the absorption of the cartilage above, behind, and below is a more prolonged and delayed process, and may take from two to five years for its accomplishment.

Following the suggestion of this physiological cure, Dunlap devised an operative procedure which gives the same results in ten days time. The quadrilateral cartilage anterior to the perforation having already been absorbed, he does a limited submucous elevation of the remaining edges of the perforation and resects the cartilage in the three remaining directions from 0.5 to 1 cm. so as to allow the flaps to approximate and cover in the cut edges of cartilage. Healing rapidly takes place and crusts disappear.

Nasal Accessory Sinuses. St. Clair Thompson² says the specialist rarely sees cases of acute sinusitis as they go first to the family physician. He nevertheless outlines the management of such cases, presumably for the benefit of said family physician. The patient should be put to bed and external heat applied. Nasal inhalation of mentholated steam every one or two hours clears the head and aids the ventilation. A nasal spray of 2.5 to 5 per cent cocaine is also indicated several times a day.

¹ Journal of the American Medical Association, February 26, 1921.

² Practitioner, January, 1921.

Menthol and boric acid is used to grease the vestibules, but nose lotions are useless and dangerous, though a mild alkaline wash may be sniffed up after the passages are clear. Thompson advocates lavage of the antrum in acute cases, but only in the hands of an experienced rhinologist.

THE FRONTAL SINUS. Mouret¹ has abandoned all of the classical operative procedures on the frontal sinus. The Killian is the least objectional from an esthetic viewpoint, but the removal of the inferior wall often allows the soft tissues to prolapse into the naso-frontal duct, thus obstructing its lumen and defeating the purpose of the operation. Often, too, there are serious inflammatory swellings of the soft tissues of the upper, internal angle of the orbit. It is a useful operation for small sinuses, but not adapted to large cavities. The operation he favors consists in making several openings in the anterior sinus wall through which curettage can be carried out. He also makes an opening in the external half of the sinus floor, but is careful in no way to disturb the orbital floor of the nasal fossa of the frontal sinus which forms the external wall of the naso-frontal duct.

Harris² thinks that failure to cure by the Killian operation is often due to the fact that it is an obliterating type of operation, and, as such, is not suitable to large sinuses with deep recesses. It is also due at times to reinfection as a direct result of incomplete obliteration, through failure to completely remove the diseased mucosa and the ethmoid, a failure of the soft tissues to sink in sufficiently to obliterate the cavity, or finally to the narrowing of the naso-frontal duct, as suggested by Mouret and Lathrop. Of course, drainage is only necessary until obliteration has taken place, but in the case of large cavities, this must be accomplished in part by granulation which takes time and if the drainage is prematurely obstructed in this manner, infection results and obliteration does not occur. Stucky, discussing this paper, says that failure is due to the fact that the function of the sinus as an air cavity is destroyed in the Killian operation—that it should simply be drained and ventilated—not obliterated. From the discussion which followed, it is evident that at the present time the pendulum has swung away from attempts to obliterate and in favor of drainage, either by the Ritter or Lathrop external procedures, or by intranasal methods. The Killian needs no defense, however, where a wide open resection is called for because of osteomyelitis of the external or internal plate, fistula or intracranial complications.

McGinnis³ operates by the internal route and does little more than secure a free outlet from the osteum frontalis by taking away agger or infundibular cells. He opens the agger cell with a Grünwald forcep and bites into the front of the ethmoid labyrinth above the middle turbinate leaving the attachment intact. The front wall of the naso-frontal duct is removed in like manner. After infracturing the middle turbinate against the septum, the anterior wall of the bulla ethmoidalis is removed with

¹ *Revue de Laryngologie, de rhinologie, et d'otologie*, August 15, 1920.

² *Journal of the American Medical Association*, October 8, 1921.

³ *Annals of Otology, Rhinology and Laryngology*, September, 1920.

forceps, cutting in an up-and-down direction. He thinks that this simple procedure gives all the drainage necessary.

THE ETHMOID. Hays¹ describes his ethmoid operation as simple, bloodless and painless, surely three consummations to be devoutly wished for. He places his patient on a flat operating table with the head slightly raised on a pillow. Fresh 10 per cent cocaine is applied to the mucosa from a dropper bottle, over all the ethmoid area and the adjoining septum. After superficial desensitization is obtained, an application of 1 to 1000 adrenalin is made. Final success, however, depends on infiltration anesthesia. A strong 5 cc glass syringe with a long, heavy-shanked needle is employed with the following solution: 5 grains of cocaine crystals in 3½ drams of sterile water with 1 to 1000 adrenalin solution added up to 4 drams. Injections with this are now made directly into the ethmoid cells, driving the needle through mucosa and bone, from before backward until the ethmoid mass is infiltrated as far back as the sphenoid. From 5 to 10 cc of this solution may be used, and anesthesia should be complete in five or six minutes. Hays now makes a deep incision above the middle turbinate with strong nasal scissors, and with a thin, sharp chisel, placed in this incision, the ethmoid mass is liberated near its upper boundary. Of course, the chisel must be driven in a line parallel to the floor of the nose. When the sphenoid is reached, the whole mass is pushed downward with the chisel into the nasal cavity. Sometimes the chisel must be used to free the outer wall of the ethmoid labyrinth also. The entire ethmoid may now be removed with a suitable snare and, as the operation is bloodless, a good operative view is obtained and much danger averted. Fragments of the upper cells remain and must be removed with a suitable punch. The sphenoid ostium is usually in plain view.

Portmann,² considers infection of the ethmoidal labyrinth a frequent cause of those cases of interminable rhinitis which are the despair of patients. The author, having pointed out that this is often disregarded, considers that when it is treated systematically and radically, this being the only efficient method, the prognosis of nasal suppurations will be greatly improved.

Portmann, following the Bordeaux school, is a convinced adherent of the radical operation by the nasal route. He sets forth its technical process: Local anesthesia with cocaine, 10 per cent; ablation by means of a cold snare, or by extraction of the attainable polypi; excision with flat forceps or "bec de canard" forceps, of the middle turbinate bone and ethmoidal cells within reach. The ethmoidal labyrinth being open, a *thorough cleansing* of the ethmoid is then proceeded with by means of Moure's scoop, an instrument rendered harmless by its shape.

The hemorrhage is generally of small dimensions. No packing is employed. Postoperative local attendance: none. Nasal fossa not to be touched, no powder or washing required.

This process, which is simple in its execution, is also simple in its consequences, and according to the author, deserves to be more generally practised than it has been up to now.

¹ Laryngoscope, March, 1921.

² La Presse Médicale, April 21, 1920, No. 24.

THE MAXILLARY ANTRUM. Dutrow¹ thinks that the greatly increased incidence of infection of the antrum of Highmore during the last few years is partly due to the several epidemics of influenza that have been prevalent since 1918, but also to recent activities of exodontists, who have not only discovered many old infected antra but have actually infected many more by perforating the alveolar process without knowing it, or by reckless probing without the necessary aseptic precautions. Owing to the universal hunt for the source of focal infections, a more thorough search of the sinuses has brought many unsuspected cases to light. These latter cases require most careful history taking, particularly in regard to their dental work, as the author believes that about 70 per cent are due to dental infections, a view also expressed by many leading dentists and controverting earlier rhinological claims that only about 25 per cent were of dental origin. In many cases free pus cannot be detected but there is present heavy viscid mucous in the middle meatus and the choana, there is a slight shadow in transillumination with a dark pupil, and the *x*-ray will confirm the diagnosis. So great confidence is felt in the *x*-ray diagnosis that Dutrow feels it unwise and unnecessary to expose his patients to the risk of a diagnostic needle puncture. Certain risks in this procedure were pointed out by Gording and commented upon in last year's *PROGRESSIVE MEDICINE*. If the antrum is full of pus, it is easily diagnosed without lavage, and if the lavage returns clear it does not necessarily show that the lining mucosa is not badly diseased. The maxillary is the sinus most frequently diseased, with the frontal, ethmoidal and sphenoidal following in the order named, and operation on the ethmoidal should never be undertaken until disease of the other sinuses has been definitely disproved.

Dutrow concludes that:

1. The incidence of infection is greater than generally supposed, and physicians and dentists are recognizing the existence of *latent* antral infection more frequently.
2. Many infected antra are undiagnosed because of the absence of subjective symptoms. The trocar and irrigation is a very limited aid to diagnosis, is not without danger, is without curative value and is misleading.
3. The Caldwell-Luc operation offers the most perfect permanent result if carefully done, with a minimum sacrifice of normal structures.
4. Postoperative irrigation should be used only when definitely indicated and not as a routine.

That the maxillary sinus mucosa may show advanced polypoid degeneration without pus formation is pointed out by Emerson² and as secondary atrophy may have taken place, *x*-ray and transillumination may be of no help. The middle turbinate may be normal but needle puncture may return a colorless serum or gelatinous material which is considered diagnostic. A history of repeated head colds with one side constantly involved is important, but the case must be diagnosed partly by exclusion. Operative removal of the diseased mucosa and polypoid

¹ *Laryngoscope*, May, 1921.

² *Ibid.*

masses is the only treatment that will avail and an ethmoidectomy is usually indicated in addition. These cases are all chronic in type and if the secondary atrophy is far enough advanced, most of the diagnostic evidence of chronic antral disease disappears.

The intranasal operation on the antrum, as well as on the frontal, becomes more and more popular. Here it is not a question of obliteration, which probably never occurs and is never sought for, but only of more or less permanent drainage.

Theobald¹ suggests certain modifications of Canfield's well-known technic, that somewhat simplify that operation. In common with many others now-a-days, he rarely finds it necessary to sacrifice any part of the inferior turbinate, unless the anterior end is so large as to fill the inferior meatus. If in the way, it is infracted and pushed upward against the septum until the end of the operation, when it is restored to its original position. After elevation of the periosteum of the inferior lateral nasal wall and also that of the anterior antral wall in the usual manner, with a sharp knife, a longitudinal incision is made in the elevated mucoperiosteum of the inferior meatus from the upper end of the primary vertical incision over the crista, immediately beneath the inferior turbinate attachment backward to the end of the periosteal elevation. A second vertical incision at this point frees a rectangular flap to the floor of the nose, where it is now turned down out of the way until the bony removal is accomplished. The bone from this denuded area is removed quickly by strong rongeur forceps without the aid of chisel or drill. The crista pyramidalis is first bitten away and access had to the antral cavity, after which the naso-antral inferior wall is easily removed, the sinus inspected, polypi and diseased mucosa curetted away, the rectangular flap turned into the cavity and held in position by packing. This method results in a permanent opening through which the sinus is easily inspected and drained, and, the author states, accomplishes more easily all the benefits obtained by other methods.

In doing the *radical operation on the maxillary sinus*, Smith² uses the Denker technic and applies a Thiersch graft in one or two pieces to the carefully dried walls of the entire cavity. This is held firmly in contact with the denuded bone by the insertion of a small, soft balloon on the end of a No. 20 catheter through the nose and inflated to produce gentle, even pressure. The wound in the canine fossa is closed as usual. At the end of a week, the balloon is deflated and the cavity gently irrigated to remove desquamated skin. The result is a smooth skin-lined cavity in place of one lined with scar tissue.

THE SPHENOID. Much difficulty and dissatisfaction has been encountered in the *x-ray* demonstration of the sphenoids by vertical view; that is, in the demonstration of the horizontal plane of these sinuses so as to project them side by side in horizontal section. Pfahler³ suggests a solution that has proved satisfactory in his hands. A film two by three inches in size with one end rounded to fit the pharyngeal

¹ *Annals of Otolaryngology and Laryngology*, March, 1921.

² *Journal of the American Medical Association*, December 4, 1920.

³ *Annals of Otolaryngology and Laryngology*, June, 1921.

wall is placed in the mouth and pushed firmly backward. This gives a definite level for the projection of the outlines of these sinuses, is close to them, and eliminates most of the irregular extraneous shadows of overlying bones, as one has above this film only the base of the skull. This technic demonstrates clearly the outline and size of the sphenoidal sinuses projected side by side and gives also a definite idea as to the position of the septum.

Dean's¹ work on the *sinuses in children* is now well known to all rhinologists and he is constantly adding to our supply of knowledge in these intricate and difficult conditions. Indeed the diagnosis of chronic sinus disease in children under five years of age presents so many difficulties that it is considered necessary to hospitalize them for purposes of study. The treatment of the acute sinus infections in children is, however, usually simple enough and consists in the administration of a laxative, rest in bed and attention to diet. Eighty per cent of chronic lesions are cured by tonsillo-adenoidectomy without any other treatment, but nasal obstructive lesions, though rare, are sometimes found and may need correction. A warm dry climate has a decidedly beneficial influence on obstinate cases, and autogenous vaccines are most useful except in the case of hemolytic streptococcus infections. Nasal irrigations of salt solution are used, administered from a fountain syringe with not more than 18 inches elevation and with the baby placed on the side or abdomen with the head lower than the body. This is indicated in all cases with much nasal discharge. Suction is employed with profit, and dichloramine-T is found to be beneficial and not to irritate the most sensitive noses.

Hays² treats his cases of sinus disease in children in the most conservative way. Suction will remove most of the discharge as proven by x-rays taken before and after its employment. Surgical procedures rarely help these infections, while the less done locally and the more generally, the better.

The diagnoses and treatment of sphenoidal sinus disease in young children is just as important as in adults, as such disease may be responsible for cardiac and kidney lesions, arthritis or any other lesion due to foci of infection. The sphenoidal sinus may be large enough at the age of five years for infection to involve the second branch of the fifth nerve or to approach the Vidian. Continued nasal discharge and asthma may be dependent on this condition alone. In diagnosis the x-ray is of value in demonstrating the presence or absence of the sinus but it is of little value for demonstrating the condition of it if present. Mosher's statement that "precocious development of the sinuses may make any or all sinuses of surgical size earlier than we expect" must always be borne in mind in dealing with the sphenoidal sinus in children.

In Dean's clinic in less than a year there were 96 demonstrated cases of suppurative sinus disease in children under thirteen years of age, and of this number 11 had sphenoidal infection. In all of his cases

¹ Transactions of American Laryngological, Rhinological and Otological Society, 1920.

² Ibid.

of serious multiple arthritis that were resistant to treatment, the sphenoids were infected, with or without involvement of the other sinuses.

Diseased tonsils and adenoids are the main sources of infection in children.

In diagnosis, the nasopharyngoscope can be used with ease and gives reliable information as to sphenoid infection, though repeated examinations are often necessary. Sounding and irrigation of the sinus, however, gives the most exact information, but must be done under a general anesthetic, usually given for some other purpose. If macroscopic pus is present in the washings drawn out through the catheter, it is considered diagnostic.

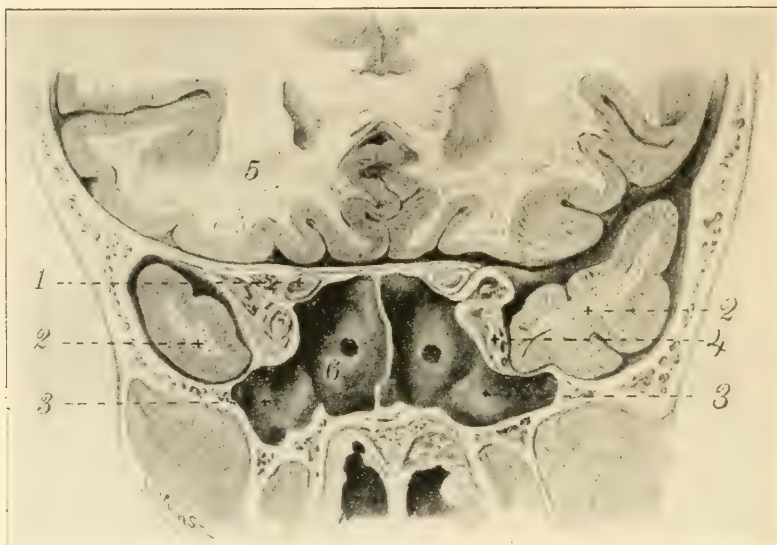


FIG. 6.—A drawing of a frontal section through the sphenoidal sinuses at the plane of the tip of the temporal lobes. The frontal walls and ostia of the sphenoidal sinuses are exposed. Particularly note the recess-like lateral expansions of the sphenoidal sinuses beneath the cavernous sinuses to come in contact with the temporal lobes. 1, optic nerve; 2, temporal lobe; 3, lateral recess of sphenoidal sinus; 4, cavernous sinus; 5, frontal lobe; 6, sphenoidal sinus. (Schaeffer.)

Schaeffer's¹ anatomical studies show that the sphenoidal sinus not infrequently extends sufficiently far into the great wing of the sphenoid bone beneath and lateral to the dural cavernous sinus to come into relationship with the temporal lobe of the brain. It is generally believed that the only direct lateral relationship of the sphenoidal sinus is the dural cavernous sinus and its contained structures. The diseased middle ear is most commonly the cause of abscess in the temporo-sphenoidal lobe, but it is evident from the accompanying plates that in such cases it would be well to exclude the sphenoidal sinus in each case in spite of the fact that it is only when the sphenoidal sinus pneumatizes sufficiently far beneath the cavernous sinus and into the great wing of the sphenoid that

¹ Journal of the American Medical Association, May 28, 1921.

its topographical relationship with the temporal lobe becomes intimate and important in the presence of suppuration in its cavity.

ACCESSORY SINUSES AND EYE DISORDERS. Cushing¹ reiterates his belief that sinus disease does not cause choked disks and that many unwarrantable ethmoid operations are performed for failing vision when the true cause is a brain tumor, not diagnosed because not looked for, though in the *acoustic neuromas* the first symptoms are aural and should be detected by the otologist. These tumors, when small, produce no serious symptoms, but, as they enlarge, tinnitus, followed by deafness, is the common history. The eighth nerve finally becomes incorporated in the tumor and its fibers destroyed and the facial may also be compressed, but often without discernable palsy. Numbness of the face,

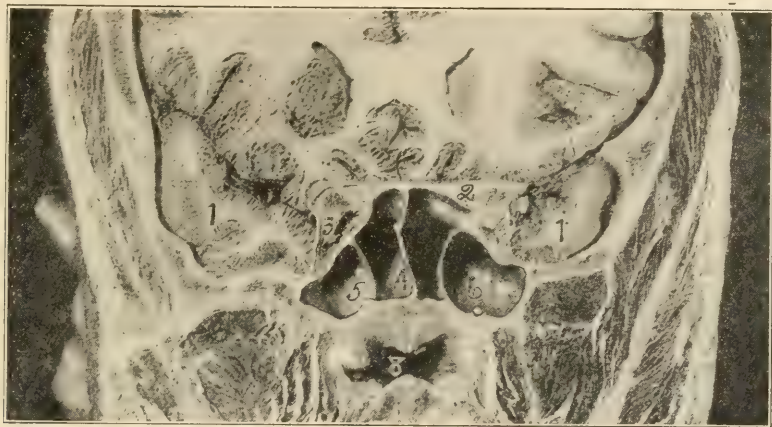


FIG. 7.—A photograph of a frontal section through the sphenoidal sinuses, brain, etc., at the level of the anterior poles of the temporal lobes. Note the incomplete osseous septums in the right and left sphenoidal sinuses, leading to recesses which extend lateral beneath the cavernous sinuses and come in contact with the temporal lobes. The exposure of the photograph is such that one looks toward the dorsal wall of the sphenoidal sinuses. 1, temporal lobes; 2, optic nerve; 3, cavernous sinus and contained structures; 4, septum between the right and left sphenoidal sinuses; 5, incomplete osseous septum partially dividing the right sphenoidal sinus; 6, lateral recess-like expansion of the left sphenoidal sinus; 8, nasopharynx. (Schaeffer.)

from compression of the fifth is common, and the ninth, tenth, eleventh and twelfth nerves are likewise flattened. Pressure is produced against the brain stem and cerebellum, with the typical cerebello-pontile angle syndrome—nystagmus and cerebellar incoördination. Lastly choked disk, headache and blindness due to general pressure of the hydrocephalus, appear. A choked disk, however, is considered due to mechanical, not inflammatory causes and the term optic neuritis, in these cases, is a misnomer.

Stark,² in common with most ophthalmologists and rhinologists, as commented upon last year, fails to agree with Cushing in his contention.

¹ Transactions of American Laryngological, Rhinological and Otological Society, 1920.

² Journal of the American Medical Association, August 27, 1921.

Retrolbulbar neuritis (secondary to diseases of the nasal sinuses) in its simple form is, according to him, manifested by sudden monocular impairment of vision, varying from partial to total blindness, with a central scotoma for color, and a normal fundus. There may also be variation in the size of the pupil, ptosis, exophthalmos, swelling of the lids, pain and tenderness in the orbit, engorgement of the retinal veins, paling of the optic disk, neuritis, varying from simple blurring of the edge to the *stage of greater elevation known as choked disk*, enlargement of the blind spot, central and paracentral scotomata for white and color, and contraction of the field of vision. Frequently both eyes may be involved and he states that *all* these symptoms have been found and reported upon by men of such recognized ability that there can be no question as to their correctness. He considers this condition due to pressure, indeed, either sudden or gradual, but not necessarily the intracranial pressure of a slow-growing central tumor. His explanation of the pathology is as follows:

"The pathology is based on two factors: primarily, the infection of one or more of the nasal sinuses, usually the posterior, with interference with drainage through the natural opening caused by anatomical obstructions or swelling of the soft parts. This condition may exist for many years without the knowledge of the patient, the result of which is the thickening of the mucous membrane, the development of periostitis, osteosclerosis, or thickening of the bone; osteoporosis, or rarefaction of the bone, being in fact that condition found in other parts of the body, termed osteomyelitis. Rhinologists classify this as hyperplasia.

The second factor is the sensitization of the tissues of both the sinus and the orbit by the bacterial proteins, producing an allergy resulting in a localized anaphylactic reaction each time the individual comes in contact with a fresh infection of the same bacteria in the nose, and possibly in other parts of the body. For that reason many of these cases give a history of attacks resembling hay-fever, or acute coryza, shortly previous to the eye trouble."

As the eye symptoms are the most prominent, the oculist has the first opportunity to make the diagnosis, and in this respect central scotoma for color is the most important, though enlargement of the blind spot and, of course, exophthalmos, are very convincing when present. Sudden interference with the action of the pupil, often undetected, is of great importance in the diagnosis, but hysteria, intracranial disease anterior to the chiasm, toxic amblyopia in binocular cases, syphilis, brain tumor and insular sclerosis must be excluded.

From a nasal standpoint, it is unusual to find the common symptoms of sinus infection as pus, polypi, history of nasal discharge, etc., since we are dealing with a closed sinus. Otherwise there would be no pressure. A deflected septum and a middle turbinate tightly pressed against the lateral wall should always be suspected. X-ray findings are often negative, but brilliant recoveries of vision not infrequently follow operations on cases presenting obscure and uncertain findings. Stark believes in operating without definite signs of sinus involvement, if, after thorough investigation, other causes have been excluded, since

the danger of an ordinary nasal operation is in no way to be compared with the danger of losing the sight. Undoubtedly the earlier the pressure is relieved the better the chance for complete recovery.

White¹ agrees in all points with Stark and emphasizes the importance of excluding acoustic and other brain tumors, which is usually accomplished by a neurological examination without much difficulty. In many of these the central field may be good, in contrast to the central scotoma of sinus disease, or there may be a binasal or bitemporal hemianopsia or a homonomous hemianopsia. Some cases recover without operation and he believes the position and size of the middle and superior turbinates have great bearing on this question of recovery. Blindness, however, may speedily result unless the accessory sinuses receive prompt attention by drainage. A normal nose does not produce blindness, but in many that seem normal, there is infection even if it is not evident.

Mullen and Ryder,² from extensive animal studies of the *lymph drainage of the accessory sinuses*, conclude that lymph drainage from the antrum is by way of the submaxillary and internal jugular nodes, though the subparotid and retro-sternal nodes may also be reached by absorption from the antrum. Absorption from the frontal follows the same course, and also that from the meninges, while there is little absorption from the *uninjured* mucosa of the nasal fossæ.

Lymphatic drainage is largely regional and anastomosis from node to node and from side to side is free. Infection at any one point of the nasal or sinus mucosa, which are continuous, can probably be conveyed by lymphatics to practically any other point.

Webb and Gilbert³ find few cases of bronchiectasis or of chronic bronchitis in which chronic infection of some or all of the accessory sinuses does not exist. Bilateral empyema of the maxillary antrum was most frequently encountered. The findings have been invariably proved correct by the opening and draining (pus) from these sinuses. The pus usually contains pneumococci as does the sputum. Many of these cases (as in those cases of blindness mentioned above) give a history absolutely negative for sinus disease, and many that were cured by sinus drainage had been treated for tuberculosis for long periods.

Malignant Growths of the Nose and Throat. Barnes⁴ has written a great deal on malignant neoplasms during the last few years and his experiences are of value. Much of his work was commented upon in *PROGRESSIVE MEDICINE* last year, but this paper is worth detailed study. Difficulty of diagnosis is always present in the early stages when, of course, the growth is most amenable to treatment. In the antrum, it is inevitable that much progress has been made before the surgeon sees the case. Pain in the alveolæ is a common early symptom but is invariably mistaken for some dental affection. Pain in the cheek suggests a mild, subacute empyema but pus in the middle meatus is rarely seen. If a bloody serum is found in the antrum, it is very suggestive of malignancy.

¹ Laryngoscope, August, 1921.

² Ibid., March, 1921.

³ Journal of the American Medical Association, March 12, 1921.

⁴ Laryngoscope, October, 1920.

Any case of supposed empyema of the antrum, acute or chronic, that shows variation from the accepted rule, should be investigated by an exploratory opening through the canine fossa. The microscope will settle any doubtful appearances. Symptoms of secondary involvement of the ethmoid usually do not occur until after the antral symptoms have been pronounced for sometime, but *primary* ethmoid malignancy gives rise to nasal obstruction and epistaxis at an early date. The operation of the general surgeon by resection of the entire upper jaw is condemned—it is only of service when the disease is confined to the antrum. On the other hand, the operator must follow the disease regardless of anatomical considerations until all that can be found is eradicated, and the operative field must be radiated immediately and at subsequent dressings. Barnes' open method of treatment was described in detail last year. Fortunately, these tumors form metastases slowly and any case is considered operable that does not show brain involvement or metastasis in the neck. Operation followed by radium is the method of choice in treating these tumors. Radium without operation is considered useless.

Pancoast¹ finds radiation and electrothermic methods rather uniformly successful in small cancers of the face. The cosmetic results are certainly better than when surgery is employed. Beck,² however, reviewing his twenty years work with malignant growths is very much disappointed with the results of radium and x -ray therapy. Comparing cases treated wholly surgically before radiation came into vogue with those treated with the aid of radiation, he finds from his case records that there was a greater percentage of cures when these agents were not employed. The best hope for a cure rests in early diagnosis and thorough surgical removal without radiation either before or after treatment, though there is a strong possibility that it may be of more value in the future. Best results are obtained by the careful following up of the case and reoperation at the earliest sign of recurrence.

Clarke³ recommends that at least one maximum radium treatment should be given before any coagulation or surgical removal of a malignant growth for the purpose of first inhibiting and finally rendering benign the migrating cells in the ducts and producing glandular fibrosis. A week should intervene between such preliminary treatment and operation unless it does not seem prudent to so temporize with a rapidly-growing lesion. At least three cross-fire radium treatments, six weeks apart, should also follow the operation for further inhibitory and lethal action upon any malignant cell which may remain. This may also be supplemented by x -ray cross-firing. Clark prefers radium element to radium emanation since the former is stable and thus more easily controlled. In most cases application in the form of needles is the method of choice, though in the case of small glands, external applications will usually suffice. The needles are particularly efficacious in the treatment of growths too large for penetration from the outside by capsule

¹ New York Medical Journal, May 18, 1921.

² Annals of Otology, Rhinology and Laryngology, June, 1921.

³ Pennsylvania Medical Journal, January, 1921.

or plaque, and in the more resistant forms which have been found unresponsive to radium from the outside. As many needles as necessary to radiate the entire tumor may be inserted to any depth thus taking advantage of concentric cross-fire radiation from needle to needle. When radium in needles is inserted into the tissues the entire quantity of radium is utilized in the tissue, whereas, when radium is applied from the outside, more than one-half of the radio-activity is dissipated in the air. Success in the treatment of malignant disease lies in the complementary action of surgery, electrothermic methods, radium and the x-rays, judiciously selected or combined to meet the particular requirements of the individual case. Clark is a firm believer in electrothermic treatment as is also Sir William Milligan¹ who strongly advocates diathermy in inoperable pharyngeal and epilaryngeal malignancy. In such inoperable conditions in the mouth, the tongue, the palate, the tonsils and the epilaryngeal region, diathermy, while it may not cure the disease, is almost certain to improve local conditions and relieve symptoms. The eradication of the primary focus of disease frequently leads to considerable prolongation of life associated with comparative comfort; and secondary deposits may be amenable to surgical removal. There is a certain risk of hemorrhage but the author considers it slight, although, if working in the neighborhood of large bloodvessels, it is better to do a preliminary ligature. When a growth in the neighborhood of the larynx is to be coagulated, a preliminary tracheotomy should be done because of the edema that is sure to occur, but this is not necessary in faucial growths. As patients requiring this particular type of treatment are, as a rule, in poor condition from inanition, sepsis, toxemia, etc., several sittings of short duration are much better borne than one prolonged application. The *advantages* of diathermy are:

1. It is of value when ordinary surgical procedures are contraindicated.
2. Little, if any, shock is caused by its employment.
3. With reasonable care, it is a bloodless performance.
4. It has the merit of sterilizing the tissues, blocking blood and lymphatic channels and preventing the dissemination of the cancer cell.
5. It often affords relief from pain and mechanical obstruction in cases surgically hopeless.
6. Sepsis and bronchopneumonias are less frequent than after cutting operations.

Disadvantages. 1. It destroys both healthy and diseased tissues.

2. The walls of adjacent bloodvessels may become softened and secondary hemorrhage result.

3. When the skin is involved, keloid cicatrices may result.

Rockey² has introduced a technic for RADIUM TREATMENT OF CANCER OF THE ESOPHAGUS that seems useful. If a timely diagnosis is made, the radium capsule can be placed in the very center of the tumor, and good results are obtained with an hour's treatment with 100 mg. of radium.

Procedure. A ten-yard spool of the largest size of buttonhole silk twist is threaded on a small tape, and tied loosely around the patient's

¹ Journal of Laryngology, August, 1921.

² Journal of the American Medical Association, July 2, 1921.

neck. A couple of feet may be reeled off the spool, and taken into the patient's mouth, and started with a swallow of water. The thread should be fed from the spool slowly, only a few inches at a time, to avoid a tangle above the stricture. By the next day 15 or 20 feet may have been swallowed, and the thread may even project from the anus. It may now be drawn upward until quite taut, being held by the convolutions of the intestine. The loop of the piano wire guide is now threaded on it, and while the thread is drawn taut, and then only, may the wire guide be safely passed through the stricture on the silk thread. If the

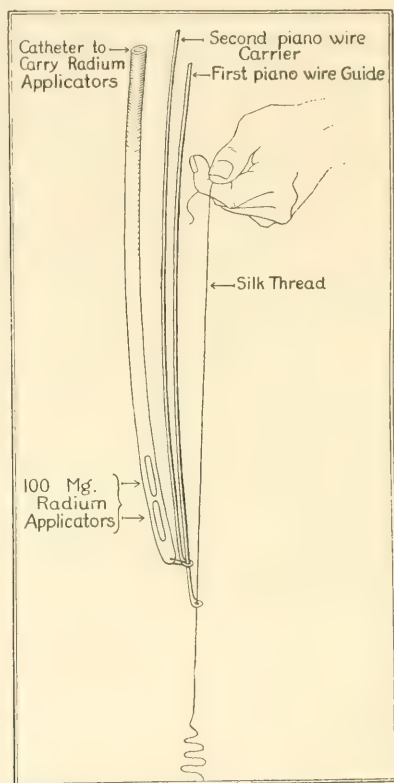


FIG. 8.—Silk thread piano wire guide, and rubber catheter containing radium applicators. (Rockey.)

lumen is not sufficiently large, it may be increased by pushing down perforated shot and metal balls in increasing size, and then in a diminishing size, to dilate the lumen, and also permit safe withdrawal. The radium applicators are pushed into a soft rubber catheter, and this is fastened to the loop of the second piano wire by a silk stitch. This may now be pushed directly into the center of the carcinoma, and the proper dose and time treatment given.

The position of the applicator is of the greatest importance. To be efficient, the radium must be exactly in the center of the mass. At

first the sense of resistance, as the end of the catheter enters it, may be sufficient. Careful measurement on the first wire must then be made of the previously ascertained distance from the teeth which the second wire must be pushed to place properly the radium applicator. It may be well to confirm this by a roentgenogram and by comparing it with the barium picture of the stricture. When this point is definitely ascertained, a record of the distance from the teeth to the upper end of the wire should be made, for use in future treatment of the case.

Comment. Treatment of cancer of the esophagus requires the coöperation of the surgeon with the roentgenographer and the roentgenologist. It is the surgeon who must accept the responsibility of the correct placing of the radium applicators.

Cancer of the esophagus probably forms metastases rather slowly. The procedure here outlined is logical, and offers the hope that one more fateful disease may at times have a favorable prognosis.

Hotz¹ has adopted a similar procedure and finds that often after an *eight hour* application, the esophagus becomes permeable for fluid foods. Exploratory incision and autopsy has shown complete cure in a number of patients so treated. When the cancer is considered destroyed, efforts must be made to prevent cicatricial stenosis. This is accomplished by the patients swallowing nickel plated lead weights of from 4 to 10 mm. in diameter. Their weight and the active swallowing drives them slowly and harmlessly through the stenosis until the lumen is enlarged to above 10 mm.

From an analysis of 50 cases of intrinsic cancer of the larynx, St. Clair Thompson² deduces that it originates on the vocal cords or in the subglottic region. It has never been found in the interarytenoid space, on the ventricular bands or in the ventricles. While it may begin on any portion of the cord, it is more commonly found on the middle or anterior portion, where it remains for a long time limited to the cord affected, though it may eventually cross the anterior commissure or invade the arytenoid and the area to the outer side of it. The inner surface of the cord may be affected primarily or by extension and the subglottic area invaded by the growth originating on a cord.

Superficial or projecting tumors of limited extent are favorable cases. Tumors situated on the middle or anterior portion of the cord are more favorable in outlook than those invading the anterior commissure or the arytenoid region. Growths imbedded in a cord or extending into it below an intact mucosa are not so favorable and an epithelioma extending along the inner margin of a cord is worse still. Subglottic cancers are not very amenable to operation by laryngo-fissure, being frequently associated with impaired mobility or fixation of the cord.

In every case, no matter how limited the growth, the entire cord should be excised from the anterior commissure to the vocal process of the arytenoid. All the growth should be removed in one mass with a wide margin of healthy tissue around it, so that the incision must extend to the lower edge of the subglottic area—it must also pass through the

¹ Schweizerische medizinische Wochenschrift, May 19, 1921.

² British Medical Journal, June 25, 1921.

healthy ventricular band and include the perichondrial lining of the thyroid ala. To facilitate this, the thyroid ala should be removed so that the laryngo-fissure becomes a partial hemilaryngectomy.

Georges Portmann,¹ on LYMPHANGIO-SARCOMA OF THE NASO-PHARYNX, gives a report of a patient who presented a tumor in the right half of the nasopharynx, a large fragment of which was drawn back by running the finger into the nasopharynx. This fragment, of a soft consistency, reddish color and spongy aspect, had the appearance of a mass of adenoid vegetations, though the anatomico-pathological examination established the presence of two neoplasms: (a) A sarcoma having round cells in some places and spindle-shaped cells in others, and (b) a genuine capillary lymphangioma.

The name of capillary lymphangioma was justified by the great abundance of lymphatic vessels, their considerable size and their structure of reticulated lymph ducts, which could not exist in the lymphatic vessels of a healthy mucous membrane.

This particular texture accounted for the softness, and spongy consistency of the tumor, being quite abnormal characteristics of a sarcoma of that part, and justified the name of "lymphangio-sarcoma."

Hay-fever and Asthma. Hay-fever and asthma continue to attract the interest, not only of clinicians, who at last see chances for relief of these heretofore almost hopeless cases, but to laboratory workers as well, searching for the reasons and rules of the underlying sensitization. Both states possess many common aspects, and Caulfield² attempts to point out the role of sensitization in both conditions. He considers bronchial asthma as a syndrome which may have widely different etiological agents, which makes its consideration and study difficult. It is frequently found as a complication of, or augmented by, other pathological lesions, and may be accompanied by a variety of complications, such as those induced by repeated attacks of true bronchopneumonia. In the study of this disease among ex-service men, the greatest difficulty has been experienced in distinguishing between chronic bronchitis with exacerbations and the varied types of dyspnea incident to this condition, and true bronchial asthma with an added bronchitis. Neither the clinical history and observation, nor a complete physical examination will differentiate between them with any great degree of certainty.

From the standpoint of sensitization, this distinction may not be so essential if one regards bacteria as capable of causing the syndrome of bronchial asthma by inducing sensitization in a manner comparable to the phenomenon as incited by the epidermal proteins. This conception does not seem to be based upon experimental data but on theoretical grounds, and the clinical evidence that bronchial asthma may disappear after the removal or successful treatment of areas harboring foci of infection. The results of autogenous vaccine, however, cannot be compared to the much more satisfactory results obtained in the cases in which specific proteins can be used.

¹ Bulletin de la Société Anatomique de Paris, July, 1920.

² Journal of the American Medical Association, April 16, 1921.

Positive skin reactions with bacteria are obtained so rarely as to be of little value, but one is inclined to try autogenous vaccines in cases where there is failure to demonstrate protein sensitization and where no definite focal reason can be found in the nose and throat. The failure of vaccine, in contrast to protein, therapy is sufficiently marked to cause one to question if both are not etiological agents acting in a comparable fashion.

Caulfield's results in protein sensitization approximate those of Walker, Gottlieb, and others, reported last year in this article. He finds the epidermal proteins outstanding in frequency and importance; the average number of different proteins to which one person is sensitive is 3.6, and the maximum number in any one case is 12.

In most of the patients with a coexisting infection which has led to pathological lesions, repetition of the cutaneous tests has shown that sensitiveness tends to reappear although decreased in varying degrees as the result of treatment.

Skin scarification is considered the only practical means of testing one person against many proteins. Caulfield uses the scalpel cut advised by Walker but differs with the latter about the non-advisability of drawing blood. A series of tests by him showed that a more definite reaction was obtained if a very small droplet of blood appeared than if there was only serous oozing. A series of five cuts is made in this manner on the cleansed skin of the flexor surface of the arm and a drop of 0.4 per cent potassium or sodium hydroxide deposited on each cut. A glass spatula is dipped into the dried protein or pollen and rubbed into the cut, a separate spatula being used for each protein. The positive reaction should appear definitely in from five to fifteen minutes.

When the offending protein cannot be deleted from the patient's food or removed from his environment, injections with protein solutions are at present the best means of inducing desensitization. In bronchial asthma the majority of cases need repeated courses of injections continued over long periods of time, if they are to be kept protected against the etiological agents. Repeated cutaneous tests show that these patients often become resensitized during the interval following the treatment of desensitization.

Desensitization seems to be best accomplished by these rules:

(a) The increase of dose ideally should be such as to produce a local reaction approximating the threshold of a slight general reaction.

(b) The interval should be as short as possible, and reinjection given at, or about, the time the local reaction completely subsides, which will usually vary between two and four days.

(c) The dose should be increased as much as possible, conforming to (a) and never decreased.

Cases of hay-fever present much less complicated pictures than do those of bronchial asthma. Tests made with dry pollens invariably give larger reactions than do the commercial solutions of pollen supplied for testing. It must not be forgotten that tests done early in the season may fail to show sensitization to a pollen which does not appear until later. Comparison of the reaction obtained before and after treatment

on patients who had been practically protected from any clinical manifestations, have shown that often the reactions were as large after as before treatment. In others, little or no sensitization was evident. It is also even possible for an individual to entirely escape all clinical manifestations of anaphylaxis even though sensitized (as shown by the tests) to a pollen or protein to which exposure is inevitable.

Caulfield thinks that among some of the patients presenting the syndrome of bronchial asthma, and in a very large majority of hay-fever patients, there is evidence that the lesion is an immunological one, closely analogous to, if not identical with, the experimentally produced phenomenon called anaphylaxis.

Wickett, Corley and Connell¹ regard bronchial asthma as the sequel of focal infection, the focus being usually in the tonsils, sinuses or in the bronchi. They do not regard the teeth as a probable cause. Surgical eradication of the focus of infection is always indicated when possible, and an autogenous vaccine administered, with a routine initial dose of 50,000,000 bacteria. The second dose is 100,000,000, the third 150,000,000; and the fourth and succeeding doses 200,000,000 at from five to seven days interval. Treatment is continued for several weeks after the patient is asthma-free, and by these methods they claim a large percentage of complete relief from symptoms, which is quite different from the findings of Caulfield.

Rogers² treats his asthma patients successfully by making cultures from the sputum, preferably obtained during or soon after an attack, subculturing a number of colonies of streptococci, and also any short chain pneumococci present, so as to include a number of strains and making up a vaccine of a strength of 100 million in 1 cc. The initial dose is 0.25 to 0.5 cc and as soon as there is little or no reaction following, the dose is rapidly worked up to 1.0 cc weekly, and later, as the dose gets to 1.5 and 2.0 cc, the interval is made a ten day one. In contradistinction to Caulfield, who never reduces a dose, Rogers decreases to one half if there is any marked reaction or any temporary increase of symptoms. The dose is then cautiously increased again when no reaction follows an injection. In 15 per cent of the cases the treatment failed to give material relief of a lasting nature. In 32.5 per cent great relief was afforded, but it was either not permanent or it was incomplete. In 52.5 per cent the patients were still well from one-half to four years after treatment.

Scheppegrell³ contends that in the case of spring hay-fever (rose-cold), the most common cause is the pollen of the *Graminæ*, which besides the hundreds of true grasses, includes the cereals, such as rye, oats and corn. Fortunately, from the standpoint of hay-fever reactions, the biological resemblance in these pollens is so great, that one species may be used for the entire group, preferably the one most common in the patient's locality. As a rule there are many grasses pollinating at the same time, but patients sensitive to one kind of grass pollen, are always sensitive to the others of this group, the reaction differing only in degree.

¹ Michigan State Medical Journal, August, 1921.

² British Medical Journal, June 18, 1921.

³ Laryngoscope, July, 1921.

It must not be assumed, however, that all cases of spring hay-fever are due to grass pollens, or if the patient reacts to these, that necessarily they alone are responsible. A botanical survey of the common anemophilous plants and trees should be made of the surrounding territory including a radius of five or ten miles, as some of the more buoyant pollen, such as that of the common ragweed, *Ambrosia elatior*, will traverse this distance in winds of sufficient velocity. Scheppegegrell's atmospheric-pollen plates, described here several years ago, are recommended in this survey. The patient should then be tested only with the extracts of pollens to which he is exposed as in this way only can dependable immunological methods be instituted.

Hemorrhage. Schaeffer¹ comments on the relative frequency with which aberrant bloodvessels are found in close relationship to the pharyngeal and faucial tonsils, and attributes deaths from hemorrhage following operation in certain instances to this anatomical abnormality. He says that the mortality from hemorrhage is almost *nil* in the well-appointed and well-regulated clinic. Few real specialists have had such disasters as death from hemorrhage following tonsillectomy, though hemorrhage is at times troublesome and alarming. Obviously, tonsillectomy is not a work for the novice, as an intimate knowledge of the anatomy involved, together with technical training and experience, is vital. The sigmoid or tortuous internal carotid artery is a condition not generally known or appreciated by many doing tonsil surgery, but its importance cannot be overstated, since the anomalous state of this vessel is unquestionably the underlying factor in many cases of visible pulsation of the pharyngeal vessels and probably of fulminant hemorrhage during or after tonsillectomy. The knowledge that this condition does, at times, exist should lead to even greater caution and study of individual cases by the trained operator, and the abandonment of the faucial tonsil operation by the novice and the occasional operator as one fraught with too great hazards.

Under normal conditions the internal carotid artery should not be injured in operative procedures on the tonsils if reasonable care is exercised, since the vessel is sufficiently remote from the tonsillar field. Normally the cervical portion gives off no branches, but occasionally the occipital, the lingual and the ascending pharyngeal arteries arise from it. The internal carotid itself may arise directly from the arch of the aorta or from the innominate. Total absence of the internal or of the external carotid occurs and the internal carotid may be, perhaps not infrequently, very tortuous or redundant in its cervical course. Visible and frank pulsation of the pharyngeal wall due to the nearness of large, aberrant and tortuous vessels is apparently very common.

The extrinsic arteries of the faucial tonsil and of the adenoid are usually too small or too remote and well surrounded by muscle and loose connective tissue to give rise to the visible pulsation in the pharyngeal wall. The carotids, are, as a rule, too remote from the faucial wall to be factors in this regard, but, at times, they do approach dangerously near the tonsillar fossa, and not infrequently give rise to visible pharyngeal pulsation.

¹ Journal of the American Medical Association, July 2, 1921.

Schaeffer concludes that in order to avoid serious consequences, the throat should be carefully inspected and palpated in all cases preliminary to a tonsillectomy in order to judge of the nearness of large or aberrant bloodvessels. The danger lies in inadvertently tearing the superior constrictor muscle or the thin bucco-pharyngeal fascia. The large artery frequently visible in the wall of the oropharynx and in intimate relationship with the tonsil is usually a redundant and tortuous internal carotid. The common carotid stem, in the absence of the internal carotid, the external carotid and the ascending pharyngeal and ascending palatines arteries often give rise to visible pulsation.

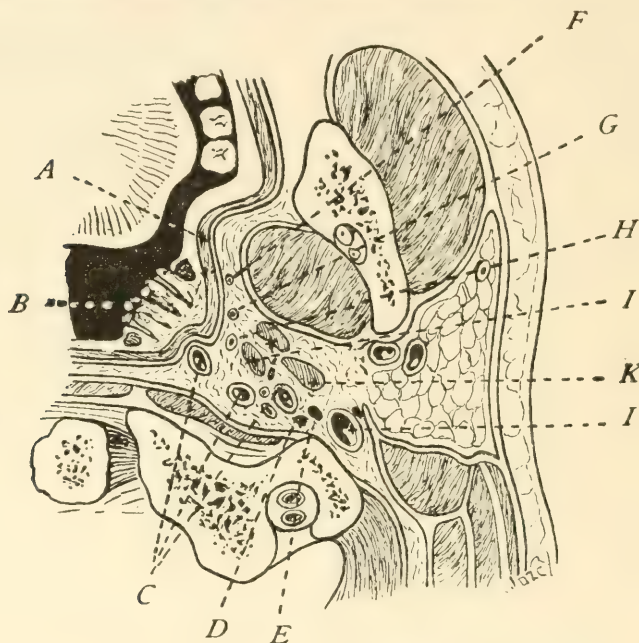


FIG. 9.—Transection through region of palatine tonsil. Particularly note the nearness of the most median limb of the sigmoid internal carotid artery to the tonsillar bed; also the rather intimate relationship of certain other fairly large arteries: A, superior constrictor muscle; B, palatine tonsil; C, sections of the tortuous or sigmoid internal carotid artery; D, vagus nerve; E, hyoglossal nerve; F, tonsillar branch of the external maxillary (facial) artery; G, ascending palatine artery; H, ascending pharyngeal artery; I, styloglossus and stylopharyngeus muscles and glossopharyngeal nerve; K, stylohyoid muscle; L, internal jugular vein. (Schaeffer.)

In an exhaustive article on TONSILLAR HEMORRHAGE, Fuller¹ discusses the causes, as well as the means for arrest, of bleeding and notes that in over 14,000 tonsillectomies done in the army during the war, there was only 1 death from hemorrhage. The majority of operators find more tendency to hemorrhage when the patient is under a general anesthetic than when local anesthesia is used, the same opinion obtained by the Committee on Local Anesthetics of the American Medical Association Section which was abstracted last year.

¹ Annals of Otolaryngology, Rhinology and Laryngology, March, 1921.

There are certain anatomical conditions that make the tendency to hemorrhage greater, as explained by Schaeffer above. Fuller notes that when the facial artery makes a high loop before crossing the ramus of the jaw, there is only the superior constrictor muscle between it and the lower pole of the tonsil. The ascending pharyngeal and ascending palatine arteries are also separated from the tonsil by the thickness of the superior constrictor muscle alone, so that when very firm peritonsillar adhesions exist, it is possible to wound one of these three vessels, with a fatal hemorrhage resulting. As the ascending palatine frequently takes its origin from the external carotid instead of the facial it seems safer, in case ligation is necessary, to tie the external carotid instead of the facial. The ligatures in this instance should be placed as low as possible



FIG. 10.—Frontal section exposing the posterior wall of the nasal and oral portions of the pharynx. Particularly note the tortuous or sigmoid internal carotid artery on the left side and the fact that the final ascending limb of the artery comes into actual contact with the superior constrictor muscle, thereby being in danger's way in tonsillectomy: *n p*, nasal pharynx; *o p*, oral pharynx, *a, a*, internal carotid artery. (Schaeffer.)

in order to control the ascending pharyngeal which arises close to, or immediately at, the origin of the external carotid. Venous hemorrhage may also prove troublesome. There is at times a large vein running the length of the tonsillar fossa just external to the posterior pillar, and the veins from the tonsillar plexus empty into the internal jugular or the facial. A number of small veins empty into the larger vessels at the base of the tongue and injury to any of these may lead to troublesome hemorrhage.

Tonsillar hemorrhage is divided into three types: Primary, occurring at the time of operation; early secondary, occurring in a few hours and probably a continuation of unchecked primary hemorrhage; and late secondary, occurring after an interval of four or five days, or more, caused by the separation of the slough.

Certain conditions predispose to hemorrhage. They are blood dyscrasias such as hemophilia and purpura, high blood-pressure, arteriosclerosis, acute inflammation of the tonsils or surrounding parts, and peritonsillar adhesions. Anemic and poorly nourished children have a tendency to bleed. Fuller disagrees with Thompson in that he thinks no operation should be done in the presence of acute inflammation, either tonsillar or peritonsillar, or within a week following the termination of the menstrual period.

The radical removal of tonsils is an important surgical procedure and should only be done in a hospital after careful examination of the case. Coagulation time should be taken in suspicious cases, and, if prolonged, operation should be refused until it can be brought to normal. Adults must remain in hospital for twenty-four hours, and children for at least twelve hours.

In discussing the remedies for control of hemorrhage, the author thinks the use of adrenalin should be limited to small amounts injected with the local anesthetic. Used in excess, or on a bleeding surface afterward, while it may check the hemorrhage, there is great likelihood that the bleeding will recur after an interval due to secondary dilatation of the bloodvessels. Emetin undoubtedly shortens coagulation time and there are no objections to its use, but there are more certain remedies. The same thing applies to pituitary extract. Given fifteen minutes before operation, it materially lessens the amount of blood lost, and it has proved useful in secondary hemorrhage as well.

Calcium salts taken by mouth have little effect on blood coagulation. Thromboplastin and coagulin (tissue extracts) on the other hand, have a very definite action in shortening coagulation time, whether applied locally or given hypodermically. Animal serum also is of great value but must be used with caution owing to the danger of anaphylaxis.

It seems to the author that because of its efficiency and because the risk of anaphylaxis is reduced to a minimum, that thromboplastin is the remedy of choice when agents of this class are to be used.

Blood transfusion from a properly grouped donor, or in default of this, from a member of the patient's family, is the most reliable remedy of all, and should be given a trial in severe cases or when other remedies have failed.

Pressure, properly applied, will check capillary oozing and bleeding from small vessels. If kept up for some time hemorrhage from even vessels of considerable size can be thus controlled. Pressure made with a gauze pad held in forceps is the best method and should be used immediately after the tonsil is removed. If, after a few minutes, primary hemorrhage has not ceased, pressure should be abandoned, and either the vessel ligated, or the pillars sutured. The former method is preferable in case of a single bleeding point, as there is less painful reaction. Michel clamps are dangerous since they may be aspirated when they slough off. If suture of the pillars is resorted to, gauze may be packed into the fossa, or the sutures passed through the bed of the tonsil so that, when drawn tight, there is no dead space. At least one operator uses this method as a routine in an endeavor to obliterate the fossa and obtain primary closure.

In the management of a case of secondary hemorrhage, the clot must always be removed from the fossa and the bleeding point searched for by retracting the pillar. A good illumination and a general anesthetic are necessary.

Thomasson¹ reports 2 cases of bleeding following peritonsillar abscess. One was incised while the other opened spontaneously, but both bled so profusely that the abscess cavities had to be tightly packed with a large amount of gauze tape. In 1 of them, after hemorrhage ceased, a large pulsating vessel could be seen on the wall of the abscess cavity. As both of these cases were "ripe" ones, it seems to indicate early incision as a preventive of hemorrhage, since, in old cases, there may be erosion of the vessel walls by pressure necrosis and resultant bleeding.

Körbl² recommends the use of a hot air jet for the control of oozing from large raw operative surfaces. While this method is hardly applicable to tonsil hemorrhage it might prove useful in other laryngological fields. Körbl says that the hot air current completely checks hemorrhage in the operative wound in from fifteen to thirty seconds, which saves ligating a great many small vessels. Larger ones should be ligated before the air blast is used. The method is useful in operations which leave large cavities, such as the goiter operation, and especially bone operations where checking hemorrhage by ligation is not feasible, and where there is often marked postoperative hemorrhage. In goiter and similar operations the wound could be made so dry as to enable the operator to dispense with any drainage at all, but in suppurative processes the method is not used.

The Pharyngeal and Faucial Tonsils. Adenoid study and surgery has been somewhat neglected in favor of that of the tonsil, according to Harris³ who thinks that many incomplete operations are done and that considerable damage is caused at times. To avoid facial, nasal and palatal deformity, the gland should be dealt with early. Coates⁴ agrees with Harris that most operators consider adenoid surgery as by far the least important part of the dual "T. & A." operation. He thinks we have all seen some pretty "raw" adenoid surgery, or its results. These latter are because of an incomplete operation, from whatever cause, and are not of the destructive type seen in bungling tonsil surgery, but, nevertheless, they are deplorable in that the patient fails to get the relief expected. Of course, everyone has disappointments, and adenoid masses do recur in the pharyngeal vault, but when this happens, it usually indicates some failure in technic. Most cases do well; it is only the exceptions that we are concerned with, but there should be 100 per cent of success. During the course of examinations of many hundreds of ex-service men, it was discovered that in many of those who had had tonsil and adenoid operations performed, there remained small detached masses and tags of adenoid tissue, not only in Rosenmüller's fossæ but in the mid-line as well.

¹ Journal of the American Medical Association, April 2, 1921.

² Wiener klinische Wochenschrift, December 9, 1920.

³ Pennsylvania Medical Journal, September, 1921.

⁴ Ibid.

The infected adenoid is frequently the aggravating factor in nasal infections, particularly in the sinusitis of infants and young children, as brought out by Dean and Armstrong. There can be no controversion of the fact that many cases of impaired hearing have their inception in the diseased adenoid of childhood even though the offender may have atrophied before the aural condition became marked enough for notice.

Adenoid surgery is limited, like that of the faucial tonsil, to three broad methods: cutting downward with the curette, upward with a sliding knife of the La Force type, and avulsing with forceps. Adjuncts are the use of the curette through the nose and the finger through the mouth.

There are certain points in the surgery of this region that, if followed, will materially aid in obtaining success. Coates prefers to operate with a curette, the most important factor in the use of which is that it must be of razor sharpness. If selected of a proper width to go between the eminences of the Eustachian tubes without much room to spare, and as sharp as it can be made, the entire mass can be readily removed at one sweep, leaving a clean, uninjured surface where recurrence is most unlikely to take place. A curette loses its extreme and necessary sharpness after one or two operations, and is habitually used in a semi-sharp or dull condition. The average curette seen in the usual hospital instrument case is worthless. The upcutting blade is not needed if the curette is sharp and skilfully used. Its use may be avoided in any case by incising the mucous membrane just below the adenoid prior to the downward sweep of the curette and the whole operation is much facilitated by the use of either a single, or a doubled, soft rubber catheter through the nose, under the soft palate and out through the mouth, according to Beck's method. This retraction of the soft palate enables one to operate with greater certainty and precision, and, with the aid of good illumination (no operation should be attempted without this) renders the outcome much more secure. A method employed at times with profit is thus to raise the velum palati, excise the adenoid with one or two clean sweeps of the curette, palpate the vault with the bare forefinger searching for adenoid remains, particularly in Rosenmüller's fossæ, and, if found, smooth them down with the forefinger covered with two thicknesses of sterile gauze. This all takes but a few seconds, and a gauze tampon of proper size, coated with bismuth subnitrate, or moistened with iodine and benzoin, is hastily tucked into the vault and firm pressure made for a minute. All bleeding is thus checked at once and the faucial tonsils can then be removed at leisure. By the time this is accomplished and bleeding arrested, the postnasal plug is easily removed by retracting the soft palate with the catheter, when the vault will be found dry. Where the tonsils are very large and prominent, they interfere too much for this reversal of the usual procedure.

The exploring finger should always be used after removing an adenoid. Forceps often leave a ragged and uneven field but are useful to finish with after an operation with a dull curette. The La Force instrument is good but is not sufficient in itself, as it is not readily adaptable to all sized and shaped vaults.

As a routine last step, the nose should always be dilated with a Lewis dilator, introduced straddling the septum, so that pressure on the handles crushes the inferior turbinates against the lateral nasal walls and squeezes them out. In many cases of marked adenoid hypertrophy we may be disappointed in obtaining prompt restoration of nasal breathing after operations on account of the enlargement, engorgement or misplacement of these bodies. Dilatation gives the patient physiological breathing at once with manifest good results. This is much more important than after-treatment, as healing is usually prompt and painless.

Ersner¹ finds that where the La Force type of operation is to be performed on the tonsils, it is a distinct advantage to remove the adenoid first, since when this is not done, the necessary manipulation of the soft palate breaks the temporary adhesion between the anterior and posterior pillars and starts bleeding. The nasal pack helps to determine the source of bleeding, if there is any present, since it excludes the nasopharynx, but if the pack is too bulky it may interfere with the proper application of the tonsillectome by putting the pillars too much on the stretch.

Poppi² accepts it as demonstrated that pathological conditions in the nasopharynx are the cause of abnormal conditions in the circulation of the pituitary, and, by reflex action, may modify the circulation in remote organs, upsetting the balance in the endocrine systems. Removal of the adenoid vegetations breaks this abnormal chain, but hitherto there has been little, if any, attempt to link up the adenoid with remote internal disease and clinical surgery.

Thornwalt's disease is not only a rare pathological lesion but one of which there is little reference in the literature or text books. Yerger³ reports a case that is of especial interest because it was found to be the source of a focal infection which bore a direct etiological relationship to chorea, as was proved clinically by the fact that removal of the chronic focus of infection resulted in the cure of the chorea. That chorea is due to an infection is manifested clinically by the frequent sequence of tonsillitis and acute rheumatic fever with chorea or endocarditis.

Thornwalt's disease is characterized by the presence of a suppurating canal or sinus in the recessus medius, which is the groove between the lateral halves of the adenoid. In the case described, a large adenoid mass was removed intact which showed a large canal filled with a great quantity of thick, creamy, brick-dust colored pus. The canal measured 3 mm. transversely and 15 mm. longitudinally.

RETROPHARYNGEAL ABSCESS is possibly too rarely thought of in routine examination and therefore too frequently overlooked. Frank⁴ says that with our modern conception of the physiological activity and pathological importance of the nasal, postnasal and pharyngeal lymphatics, the significance of their condition in diseased states of the nose

¹ Pennsylvania Medical Journal, September, 1921.

² Monographies Oto-Rhino-Laryngology International, No. 2, 1921.

³ Journal of the American Medical Association, January 15, 1921.

⁴ Ibid., August 13, 1921.

and throat should be more universally held in mind, and believes that any effort to popularize the seriousness of this condition will be instrumental in relieving pain and saving life.

Dyspnea is a prominent symptom in most cases, some time in the course of the disease, owing to forward pressure on, or lateral displacement of, the larynx, and this pressure early in the disease is responsible for the irritating, croupy cough.

The dyspnea, as well as the croupy cough, often leads to a mistaken diagnosis of diphtheria, when a careless oral examination has been made.

Palpation offers the most satisfactory means of diagnosis, the extent, the location and the condition of the abscess being more readily determined in this manner. The lateral, as well as the posterior, walls of the pharynx must be investigated, as it is well known that the abscess may begin in a lymph node not a true member of the retropharyngeal group.

The infection in the retropharyngeal lymph nodes may spread by the blood and lymph streams causing septicemia, pyemia or distant infections, such as meningitis, or it may spread by continuity, producing spontaneous and serious hemorrhage by erosion of the large vessels of the neck; it may involve the mediastinum or rupture into the esophagus. It may cause dyspnea by pressure or edema of the glottis necessitating tracheotomy, or pneumonia, lung abscess or asphyxiation from aspiration of pus from a ruptured abscess.

Of Frank's patients, 2 died of hemorrhage after opening the abscess, despite efforts at ligation, possibly due to some anomalous bloodvessels as described by Schaeffer above. Of the 3 other deaths in the series, 1 had pyemia and 2 pneumonia.

Operation is done by the Mierhof method which consists in palpating the abscess with the index finger of the left hand and evacuating it with a closed, curved artery forceps with the finger as a guide. When the abscess has been entered, the hemostat is withdrawn with the blades widely opened.

The position of the child during operation is held by everyone to be of the first importance. The author has his patient tightly wrapped in a sheet and laid flat on its back on the table until the abscess is opened, when it is immediately turned on its face and the body slightly raised above the head. It is almost needless to remark that no anesthetic is used.

Sonnenschien¹ points out that a careful examination of the pharynx should be made in every young child with an unexplained rise in temperature. Often on superficial examination no swelling is seen, but if the space just back of the tonsils is examined closely, in many cases the infection will be found at this point.

In many of its characteristics retropharyngeal abscess is very closely allied to peritonsillar abscess. The radical treatment of the latter is strongly urged by Heller,² who maintains that the only proper treatment of a quinsy is the dissection out of the tonsil *en masse*. The operation must be done with the best of light, a suction apparatus and ether

¹ Journal of the American Medical Association, August 13, 1921.

² Laryngoscope, April, 1921.

anesthesia by the drop method. Gas is not well tolerated by these patients. The anterior pillar is first dissected free and then the dissection carried to the dome of the tonsil and behind it where the pus will always be found. This is thoroughly aspirated out of the abscess cavity and the tonsillectomy completed in the usual manner. The opposite tonsil is always removed at the same time as it usually has been or subsequently will be the source of a similar quinsy if allowed to remain.

The operation may be done as soon as the diagnosis is made, even as early as thirty-six hours after trouble begins. This has the advantage of saving time for the patient and avoids several days of pain and loss of strength from semi-starvation and sleeplessness. The throat heals in the same time and manner as with an uncomplicated tonsillectomy, and is not more painful. Indeed the whole process is much less painful than the quinsy itself. The procedure is considered to be surgical in that it removes the cause of the infection and the whole operation is done with all parts in full view, and not by more or less aimless stabbing.

This procedure is also advocated by Holinger¹ and by others here and there in the literature. Holinger says that with the systematic and total extirpation of the tonsil, all pockets of the abscess are thoroughly drained. Patients who arrive in a septic condition, with high fever, a dry tongue, etc., from a peritonsillar abscess show an entirely different picture a few hours after the tonsils have been removed and the writer, in a large number of such operations, has never seen a case of sepsis follow or continue beyond the removal of the tonsils. There are many advantages with this method. Recurrences are frequent and in these cases the tonsils should be removed in any event. The period of recovery is not longer than a simple tonsillectomy. There is no chance of secondary abscesses forming and no chance of obstructed drainage needing re-incision. Patients who are in a decidedly septic condition are at once relieved, and the albuminuria that is a frequent accompaniment of these cases, rapidly clears up.

Multilocular abscesses are not rare and sometimes extend high up into the palate or spread between the muscles surrounding the tonsils, which explains the stiffness of the neck frequently noticed. Local anesthesia for this operation has been found entirely unsatisfactory and ether is always used, but it should be used with more than the usual care and skill since the lumen of the pharynx is often much narrowed and breathing is difficult. In one case the abscess broke during the stage of excitement. The anesthetist should be on the watch for this so that the pus may be promptly evacuated.

THE PATHOLOGY OF THE TONSILS IN RELATION TO TUBERCULOSIS is still the object of careful study. Tonsils removed by operation were found by Miller² to show an incidence of active tuberculosis in 2.35 per cent. The ages of his patients ranged from two to fifty-nine years. Tonsil tuberculosis is divided into three types: focal crypt infection; ulcerative lupus-like lesions; and diffuse miliary tuberculosis. The crypt infection is the most common type, is usually unilateral, involves

¹ Annals of Otolaryngology, Rhinology and Laryngology, March, 1921.

² Archives of Internal Medicine, June 15, 1921.

one or more crypts only and avoids the lymph follicles. While some of these cases are autoinfections, the majority must be considered cases of primary focal tonsil tuberculosis. The ulcerative lesions result from the coalescence of crypt infections or from direct extension from neighboring surfaces. Miliary tonsil tuberculosis is usually bilateral and also is frequently found in the accompanying adenoid. The tubercles are widely scattered and occur almost exclusively in the follicle and germ centers. Mixed types also occur in patients with well-developed pulmonary tuberculosis.

The attempted REDUCTION OF HYPERTROPHIED TONSILS BY THE ROENTGEN RAY has stimulated the curiosity of laymen and physician alike and numerous queries are constantly being put to the specialist in regard to this subject. Murphy,¹ *et al*, has reported the results to date obtained by the Rockefeller Institute for Medical Research, though I dare say every radiologist in the country has recently given this method a trial. Murphy and his collaborators say that it has been shown that the x -ray has proved efficient in reducing enlarged spleens and other glands, such as the thymus. It has also been shown experimentally that the susceptibility of lymphoid tissue is so much greater than the susceptibility of other tissues that by the judicious use of this agent the major portion of the lymphoid tissue of the body could be destroyed without appreciable damage to the remaining tissues of the body. The object of the use of the x -ray upon the tonsils is not to cause complete destruction but to so reduce them that the shrinkage may be accompanied by proper drainage of the crypts.

The time of exposure for each tonsil is given as from three to seven minutes, according to age; and the approximate value of the dose, after filtration by 3 mm. of aluminum is from 1 to $1\frac{3}{4}$ skin units. The ray enters under the angle of the jaw and penetrates the soft tissues to the tonsil. The area exposed is about three square inches, the surrounding parts being protected by heavy sheet-lead.

In all but 4 cases out of 48 studied, there was marked improvement. Two weeks after exposure there was distinct shrinkage of the tonsil, which continued to shrink for a month or two more. The crypts opened and drained, exudate disappeared and the surface of the tonsil became normal in appearance. Of even greater interest is the reported disappearance of other lymphoid deposits in the throat—the nodules of the lateral and posterior pharyngeal walls. It is easy enough to deal with the infected or enlarged tonsil surgically, but these extra-capsular masses have for long been somewhat of a stumbling block.

The action of the x -ray upon the adenoid, being applied through the back of the neck, was not nearly so marked. Some shrinkage was noted, but the failure to secure better results is attributed to the fact that but little radio-energy reached the adenoid through the bones of the head.

It is frequently asked if the x -ray sterilized the tonsil. Murphy says that the common organisms of the throat were unaffected by treatment, but that the streptococci disappeared by the fourth week

¹ Journal of the American Medical Association, January 22, 1921.

after treatment in a majority of the cases. This, however, he attributes to the increased drainage of the crypts and not to the direct action of the ray.

Witherbee,¹ who is a co-worker with Murphy, confirms these statements. There seems to be no objection to this method, since the dose used is very mild, being only about one-fourth that used in the treatment of ringworm of the scalp, and, in many of the cases, only one sitting was considered necessary. Where a fractional dose is repeated at two weeks intervals, the normal cells have a chance to completely recover from any damage they may have sustained, while the pathological cells, being more sensitive, are unable wholly to reestablish themselves. Repeated small doses are therefore advocated.

The shrinkage induced produces an eversion of the crypt, lessens its depth, and relieves the distortion and retention. The infected fibroid tonsil, the type commonly found in adults, is more amenable to the x-ray on account of the susceptibility of the immature cells in the enlarged germinal centers.

Hays² considers the tonsil often responsible for *systemic disease* even when the tonsils are small and apparently uninfected. In all suspicious cases they should be cultured and the finding of any form of streptococcus should be considered sufficient evidence to call for their removal, if there is associated systemic disease. While vaccines may be of value under these conditions, it seems better to be rid at once of the source of infection, but the tonsil must be entirely removed since a small infected remnant may continue to poison the system indefinitely.

Selfridge³ in seeking for the *reason why removal of tonsils does not always relieve the symptoms* for which the operation was done, has reached the conclusion that there is an interrelation of the tonsil with the ductless gland systems, and that the failure to recognize such relationship helps to explain the cause of these failures. The signs of dysfunction of the endocrine system, as evidenced in the child, and frequently in the parent also, should receive proper attention and proper medication before the patient is subjected to a tonsillectomy.

He believes, too, that the apparent gland dysfunction in many cases is sufficiently predominant to offer a satisfactory explanation for the many reinfections, colds, etc., seen in large numbers of children, usually grouped under the heading of *exudative diathesis*.

It is largely to this type of children who have a history of beginning life with eczema, drippy noses, asthma, difficulty in digesting milk, fats, carbohydrates or eggs, with big heads, big bellies, fat pads, mental slowness or unusual precocity and other signs of status lymphaticus, that our attention should be particularly directed.

He quotes McGarrison as follows: "Adenoids and enlarged tonsils occur in children who have an inadequate supply of thyroid secretion. The hypertrophic condition in each case is apparently the result of an endeavor on the part of the organisms to supply an internal secretion

¹ Laryngoscope, May, 1921.

² Medical Record, 1921, 99, 304.

³ Annals of Otolaryngology and Rhinology, June, 1921.

as nearly allied as possible to the one which is lacking. If the hypertrophy is not very pronounced, and if it has not been very long in existence, great enough and protracted enough, that is, to produce complications, such as disease in the tonsils themselves or in the ears, then the exhibition of thyroid extract will cause their retrogression."

Whether the presence of adenoids in these cases causes hypopharyngeal symptoms by infection of the posterior nares or adenoids primarily does not seem to Selfridge a settled question. He thinks that there are evidences that the state of status thymolymphaticus was either acquired very early in life or was due to hereditary conditions, and thus the large size of the adenoid is simply an index of the dystrophy present.

Nerve Blocking for Local Anesthesia in Tonsillectomy. Thompson¹ says that it is a well-recognized fact that local anesthesia for surgical work can be more surely obtained by blocking the nerve than by attempting to inject its terminal filaments. The posterior and external palatine nerves which supply sensation to the anterior surface of the tonsil are easily blocked at their point of exit, immediately behind the posterior palatine foramen, which is just internal to the third molar tooth. While the glossopharyngeal nerve also supplies the tonsil, its relationship is not yet clearly enough defined to determine upon a definite method of blocking. There is, however, just outside the constrictors of the pharynx, a space of loose connective tissue which is continuous from the pharyngeal wall, outward and backward, and which surrounds the carotid arteries, the glossopharyngeal nerve and various other structures. This space can be easily infiltrated, thus blocking the nerve in a general way, by one injection made external to the anterior pillar at the junction of the upper and middle thirds of the tonsil, where there is only mucous membrane to be penetrated by the needle. Four drams of a 1 per cent solution of procaine are used, 10 mm. being injected on each side of the palate and 2 drams in the connective tissue spaces on each side, as described above. There is thus no danger of thrusting the needle through an infected crypt and carrying infection into the deep tissues of the neck.

This method was first used by Capt. Edward W. Collins and myself at Camp Hancock, in 1918, and demonstrated by us before the Section of Oto-Laryngology of the College of Physicians of Philadelphia, in 1919. It proved most satisfactory and has been in general use in my clinics since then although at times the blocking of the palatines is omitted. We deduced for our experience two points not mentioned by Thompson. The first is that when the palatines are successfully blocked—an easy enough procedure—the tendency of the patient to gag is very much lessened, and the second that if, after an interval of three minutes, speech becomes very thick, or articulation almost impossible, anesthesia is practically complete. The absence of this latter symptom, however, does not infer necessarily that anesthesia is imperfect. In our technic, the needle is not thrust through the pillar, but the pillar is lifted on the needle point and pushed aside, the needle following the anterior wall of

¹ *Annals of Otology, Rhinology and Laryngology*, September, 1920.

the capsule to the desired point. In searching for the posterior palatine foramin, the needle will at times, unless care is exercised, perforate the soft palate, and the solution may be injected into the nasopharynx, an accident immediately discovered and easily corrected.

For the enucleation of the tonsil by dissection, Greene¹ has devised a palate retractor, illustrated below. After the tonsil is seized with the forceps, the assistant retracts the soft palate with gentle pressure and thus brings into accurate view the line of attachment of the palate to the tonsil. The mucous membrane at this point is incised with a sharp knife or scissors, thus sparing not only the muscular tissue but also the mucous membrane. This makes easy the initial step of the dissection which can from this point be carried out in the usual manner.

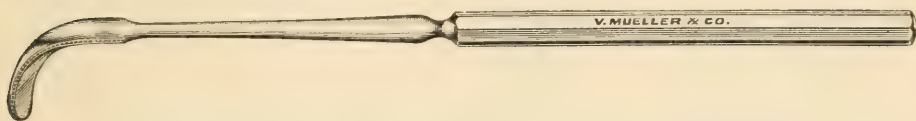


FIG. 11.—Palate-tonsil retractor. (Greene.)

Victor² reports the end-results on 500 consecutive cases of tonsillectomy and adenoidectomy. Anatomically, the results were 84 per cent good; 10 per cent fair (a small bit of tissue remaining on one side); 6 per cent poor. Symptomatically, the results were 97 per cent good and 3 per cent fair.

Deep Cervical Abscess and Thrombosis of the Internal Jugular Vein. Mosher³ suggests, from a study of 2 cases and a consideration of the anatomy of the neck, that thrombosis of the internal jugular vein may occur from a peritonsillar or retropharyngeal abscess as well as in the classical manner from the sigmoid sinus, and also that a deep cervical abscess may cause this condition by contiguity.

Abscess in the third compartment of the neck, that is between the middle and deep layers, is the most dangerous of all cervical abscesses; since it cannot reach the surface without perforating the two overlying layers and therefore tends to extend downward into the mediastinum or axilla. Moreover, this compartment contains the great vessels of the neck as well as the chief lymph nodes. If early incision is not done, there is danger also of rupture into the trachea or esophagus, and in a number of cases the vessels of the neck have been found to have been destroyed. This third compartment is really the pharyngo-maxillary fossa continued into the neck by the carotid sheath. It is, therefore, continuous with the fourth compartment, also known as the prevertebral or retropharyngeal.

From the standpoint of practical surgery this conception of the third and fourth compartments as one unifies the whole subject of deep cervical abscess, and emphasizes one of the chief dangers of the condition, namely, thrombosis of the internal jugular vein.

¹ Journal of the American Medical Association, July 2, 1921.

² Archives of Pediatrics, December, 1920.

³ Transactions of the American Laryngological, Rhinological and Otological Society, 1920.

Mosher says that every case of peritonsillar, or retropharyngeal abscess, active or quiescent, that has chills and a septic temperature, probably has thrombosis of the internal jugular vein and should be treated accordingly. If there is a swelling in the neck in such cases, it should be opened and the condition of the jugular investigated. This vein is the vital structure in the neck from the standpoint of infection and it is always exposed to this danger in deep cervical abscess. If the vein shows phlebitis only, it should be tied, but if thrombosis, it should be dissected out. A deep cervical abscess should be watched knife in hand, and at the first chill or sign of septic temperature the vein should be tied or excised. It must be remembered also that infection can reach the vein just as readily from the tonsil and the neck, as from the middle ear.

THE LARYNX.

That there is no more difficult operation in surgery than a properly performed intubation is the opinion of Hayne.¹ A tracheotomy by contrast is easy of accomplishment.

The general practitioner is always inclined to give massive doses of antitoxin in cases of laryngeal diphtheria, whereas 15,000 to 20,000 units are usually sufficient when the larynx alone is involved, as these patients do not suffer extensively from toxemia. Neither are the ordinary complications, such as paralysis or nephritis, frequently encountered. When death ensues, it is almost invariably due either to asphyxiation as a result of mechanical obstruction, or to bronchopneumonia.

The best results from intubation are obtained in hospital service where there are trained resident physicians and nurses, one of whom always has the patient under observation. The number of reintubations has been much reduced by waiting for four or five days before extubation is performed. Thorough sterilization of all instruments lessens to some extent the danger of complicating bronchopneumonia, and thorough cleansing of the hands is a simple but necessary precaution, often neglected.

D'Anna² confirms the harmlessness and reliability of the Polverini method of fastening the intubation tube in the throat so that all danger of its being coughed up is removed. The method followed consists in introducing an ordinary suture needle, threaded with two meters of strong silk, in the median line at the junction of the middle and lower thirds of the thyroid membrane and bringing it up and out through the mouth. The needle is cut off and the thread tied around the O'Dwyer tube which is introduced into the larynx as usual. The lower ends of the thread are pulled taught and tied over a roll of gauze, thus holding the tube firmly in place. Also, the tube can be readily taken out, cleansed and replaced if the lower end of the silk thread is left long, and a long upper thread, worn tied around the ear, remains as an aid in extubation.

¹ Journal of the American Medical Association, 1912, **76**, 1305.

² *Pediatrics*, Naples, May 15, 1921.

Freudenthal¹ says that nowadays it is possible to cure advanced laryngeal tuberculosis, even independently of the condition of the lungs. There are three principal symptoms to be combatted, namely: cough, dysphagia and stenosis of the larynx.

Cough is frequently dependent on certain conditions in the nose and pharynx, and it is therefore necessary to see that these passages are in first-class condition. Polypi are a frequent cause and are easily controlled. Septal deviations, another common cause of reflex cough, should be corrected, under local anesthesia, of course, if the patient's general condition is at all satisfactory. If accessory sinus infections exist, minor drainage and ventilation operations alone should be attempted.

Catarrhal conditions of the pharynx and nasopharynx are the most frequent source of cough, but mild applications three times a week usually suffice to keep it under control. It must be remembered that the relief of cough, as well as the other symptoms mentioned, is really part of the cure in these cases. The author protests against the removal of tonsils in tubercular patients. It may be necessary at times, but where chronic tonsillitis exists with caseous deposits, simple cleansing of the crypts is much better for the patient's general health. The lingual tonsil must not be overlooked as it is frequently hypertrophied. It may best be reduced by the galvano-cautery.

The relief of dysphagia is more important, and also more difficult, than the relief of reflex cough, since its amelioration frequently means the life of the patient, otherwise doomed. If the patient cannot swallow, he cannot obtain the nourishment essential to the cure of his general, as well as his local, lesions. Its gravity depends upon the location of the ulceration. There is an elastic ring that comprises the epiglottis, the ventricular bands, the plicæ aryepiglotticæ and the arytenoids. This ring contracts each time food passes over the entrance to the larynx and explains the pain during the act of swallowing.

As long as the surface of the larynx is intact, the prognosis is good, and spontaneous cases are not infrequent. Mild ulcerations are also amenable to treatment by application of tannic acid, chloride of zinc or argyrol. Many other drugs have value but the formula found by the author to be most efficacious is appended.

R—Menthol	0.6 to 6.0
Formaldehyde	0.6
Orthoform	6.0
Ol. amygdal. dule.	15.0
Pulv. acaciæ	15.0
Aquæ ad.	60.0
M. F. emulsio.	

It is the orthoform that has the greatest value. It is non-toxic and often gives relief from pain for several days or a week.

Tubercular ulcers will not heal if continually irritated by cough. If the cough continues after the nose and pharynx are put in order, it is

¹ Annals of Otolaryngology and Rhinology, September, 1920.

due to a lesion lower down and must be combated with morphine. If the larynx is kept quiet by these measures, the ulcerations will heal. For deep ulcerations, balsam of Peru has a very healing action, and E. W. Collins uses pure carbolic acid with good results as I can testify personally.

The galvano-cautery is the final remedy and frequently produces surprising results. Wood and Fetterolf prefer its use to that of topical applications, even in the mild and incipient cases. Infiltrations, as well as ulcerations, are indications for cauterization, the former by puncture and the latter by searing. It is probably the contraction of the resulting scar tissue that reduces the infiltration by shutting off the blood and lymph vessels.

Alcohol injections of the superior laryngeal nerve possess great value but are rather uncertain in their action. Freudenthal's method of operation is as follows: "The place where the superior laryngeal nerve penetrates the membrana thyrohyoidea can be felt with the finger from the outside. If the patient be placed on his back and the larynx pushed toward the affected side, the most painful spot can be determined with the finger. Here a needle puncture is made in a direct vertical line to the body, a little more to the outside. The needle is inserted to a depth of about $1\frac{1}{2}$ cm., feeling meanwhile for the spot where the patient complains of the greatest pain, and here the alcohol is injected. Eighty-five per cent alcohol at a temperature of about 112° F. is employed.

Freudenthal believes that primary tuberculosis of the larynx occurs more frequently than generally thought by other observers, and all tuberculous patients should have frequent laryngeal examinations, as there are numerous means at our disposal for treating and curing these laryngeal lesions. Not only should a laryngologist be attached to every sanatorium, as insisted upon by Mullen last year, but when the larynx is affected, the laryngologist should have the direction of all treatment instead of the internist.

Laryngospasm. Experimental research by Calderin,¹ on the *cause of laryngospasm*, has apparently demonstrated that it is essentially due to a lack of calcium, and that the parathyroids play an important part in the calcium metabolism. The clinical sequence seems to be at first fat dyspepsia, then disturbance in the endocrine system from the toxins generated by the dyspepsia. The parathyroids and the thymus are affected, thus upsetting the calcium balance, and this entails spasmophilia with its laryngeal spasm. Treatment must be directed toward the dyspepsia, supplying the lack of calcium, and insuring its proper assimilation by parathyroid and thymus extract.

Paralysis of the Vocal Cords. Logan Turner² says paralysis of the vocal cords is not infrequently due to malignant disease of the breast, and that there is a great tendency for such disease to secondarily infect the supraclavicular glands. Although malignant lymphatic glands in the neck and mediastinum are recognized as fairly common causes of

¹ Archives Espanoles de Pediatria, Madrid, September, 1920.

² Journal of Laryngology and Otology, August, 1921.

recurrent nerve paralysis, the sequence—cancer of the mamma, secondary glandular involvement and vocal cord paralysis—is not properly understood. While in the majority of the cases studied, the paralyzed cord was on the same side as the primary tumor, in several cases it was contralateral. In these cases the pressure may have been caused by enlarged glands in the mediastinum but there is also the possibility that it was due to enlarged supraclavicular glands pressing upon the recurrent nerve in its cervical portion. The author demonstrates lymph trunks passing from one side of the thorax to the other and connecting with the supraclavicular nodes on each side both directly and by way of the axillary glands that will readily explain how this can occur.

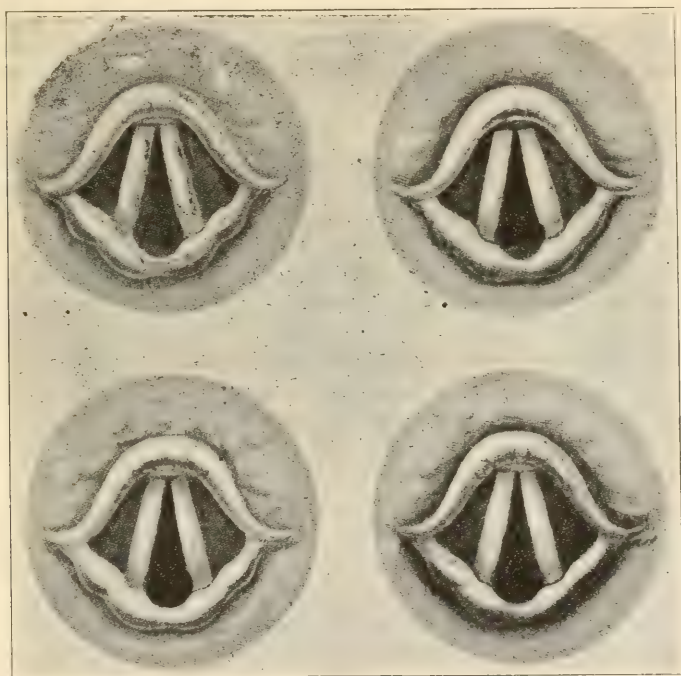


FIG. 12.—Stages of resolution in chorditis fibrinosa. (Kelly.)

Chorditis Fibrinosa is the name given by Kelly¹ to a variety of acute laryngitis characterized by the deposition of fibrin and the occasional erosion of the vocal cords. All of his cases occurred in soldiers but he does not attribute this condition to mustard gas irritation. On the contrary, it was met with most frequently after prolonged exposure during cold and inclement weather, while shouting (commands, etc.) or coughing were contributory causes. Gassing undoubtedly made the aphonia and hoarseness worse. In a recent case, the cords are pure white excepting in the posterior third and over a small area anteriorly,

¹ Journal of Laryngology and Otology, January, 1921.

both of which are red. The white patch is not the normal cord, but is a deposit of fibrin which gradually passes off, leaving exposed the red upper surface of the cord. The patch on each cord assumes a somewhat semi-oval shape, and on adduction the oval is completed, its long axis coinciding with the glottis. This exudate may exist without much change for two weeks and then rather quickly disappear, but apart from the involvement of the true cords, the larynx presents a normal appearance.

The average duration of the fibrinous exudate is three or four weeks, although the voice becomes normal earlier and the redness of the cords persists longer. Erosion is seen in about half the cases, usually in the later stages. Small notches form on the edges of one or both cords near the junction of the anterior and middle thirds; they generally disappear in a few days. In mustard gas burns, white patches were found on the posterior surface of the epiglottis, the arytenoids, the false cords and the fauces but never on the true cords—the point of differential diagnosis.

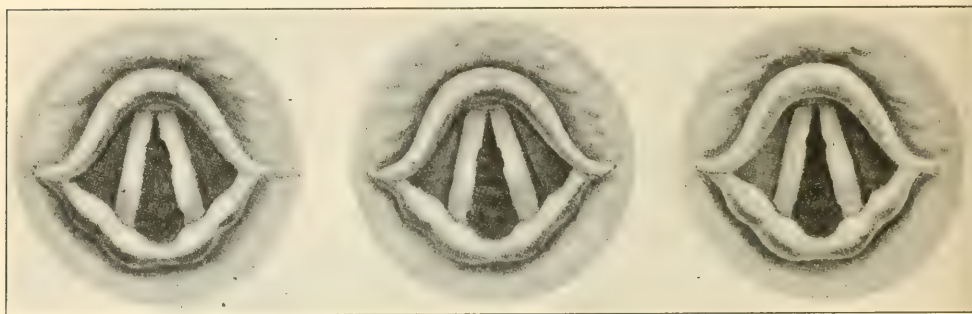


FIG. 13.—Erosions of the vocal cords in chondritis fibrinosa. (Kelly.)

Treatment consists in vocal rest. If this is neglected, or if, after the correction of a functional paresis of the cords, which is not uncommon in these cases, improper voice production is persisted in, the congestion of the cords and the hoarseness may remain.

Kelly summarizes by saying that: "It would therefore appear that in consequence of certain noxious agents, notably cold, gas, tobacco, and occasionally the influenzal virus, acute inflammation of the vocal cords is caused. Owing to exceptional factors, particularly shouting and rapid respiration, a damaging effect is produced, especially upon the vibrating part of the cord, and necrosis of the superficial epithelium results. A fibrinous exudation representing the process of repair takes place over the area so destroyed. The extent of both the necrosis and the resulting fibrinous deposit corresponds presumably to the severity of the process, and may vary from a small patch at the center of the edge of the ligamentous cord to one covering this entire region. In all cases the former situation is evidently that at which the process is most intense or the aggravating conditions most active, for there the patch persists longest. Briefly, chondritis fibrinosa appears to be a variety of acute laryngitis in which the inflammation has been limited to the true

cords, the ligamentous portions of which have suffered especially owing to excessive vibratory movement."

Angiomata of the Larynx are considered by Irwin Moore¹ among the rarest of tumors, and in a lengthy article running through two issues of the *Journal*, he reviews briefly every authentic reported case. Plates showing the variety of forms these growths may assume, are given with

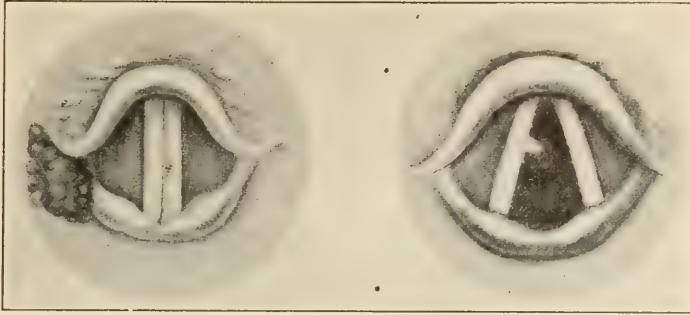


FIG. 14.—Angioma of pyriform fossa. (Morell Mackenzie.) FIG. 15.—Angioma of right vocal cord. (Solis-Cohen.)

the name of the observer. Many of them date back to the earliest years of laryngology, *i. e.*, 1874–1880, though the list is constantly, though slowly, added to.

The etiology of angiomata of the larynx is obscure. They are thought by some writers to be the result of previous inflammatory conditions of the mucous membrane, which have passed to the chronic stage, with hyperplasia of the tissues. In nearly every case, there is a history of

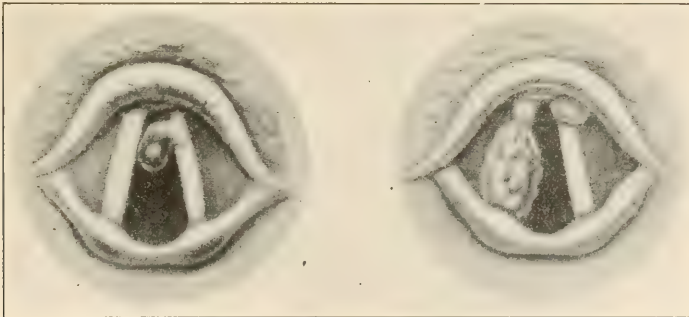


FIG. 16.—Angioma of left vocal cord. (Percy Kidd.) FIG. 17.—Angioma of vocal cords. (Norris Wolfenden.)

catarrh and they are said to occur in those who have abused their voices. They vary in size from a lentil-seed upward, but rarely exceed that of a filbert. They are seldom pedunculated, are of soft consistence, analogous to the ordinary skin nevi, and yield readily to palpation with

¹ *Journal of Laryngology and Otology*, January, 1921.

a probe. *In situ* they are of a bright red color, or dark bluish-gray or purplish in the hemangiomata type, and may be found in any part of the larynx. In the majority of instances they spring from the under surface of the true vocal cord, or from its margin, and next in frequency from the ventricular bands and aryepiglottic folds.

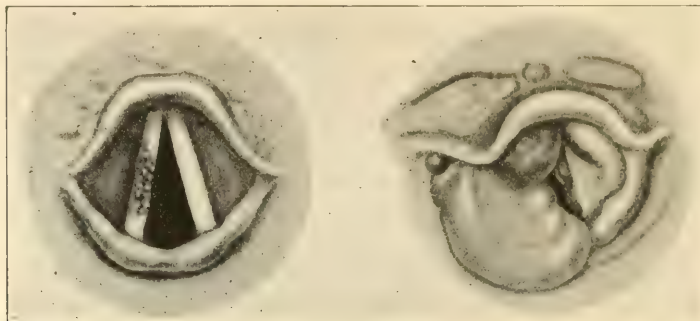


FIG. 18.—Angioma of right vocal cord.
(Jurasz.)

FIG. 19.—Diffuse telangiectatic tumor.
(St. Clair Thomson.)

The symptoms are those of chronic laryngitis extending over many years—cough, hoarseness, aphonia, dyspnea, or expectoration of mucus tinged with blood. Hemorrhage is not unusual and is, at times, difficult of control. These two last symptoms relieve the hoarseness for the time being and suggest the diagnosis, which is confirmed by inspection and palpation.

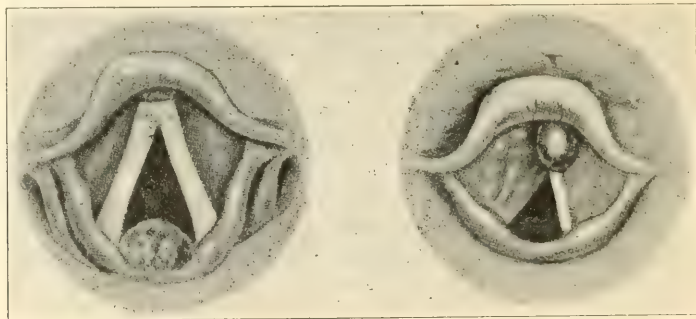


FIG. 20.—Interarytenoid angioma.
(Grünwald.)

FIG. 21.—Bilateral angiomata.
(Hirsch.)

Among the total of 71 cases recorded, hemoptysis only occurred spontaneously in 12 cases and in no case was a death reported, from hemorrhage, except that following operation. There were 3 of the latter; though considerable or severe hemorrhage followed in 25 removals.

If the tumor causes but slight symptoms, it should be let alone but otherwise removal should be attempted. This may be done by thyrotomy, by the endolaryngeal route under suspension or by the indirect

method. In the latter, hemorrhage, if encountered, is difficult of control, and laryngo-fissure is considered by many operators as the safest and easiest approach. The growth should be totally removed with a good margin of healthy tissue, and in some instances the mucous membrane has been undermined and sutured so as to cover in the denuded area. When the growth is entirely removed, hemorrhage is slight, as vessels in healthy laryngeal tissue retract readily.

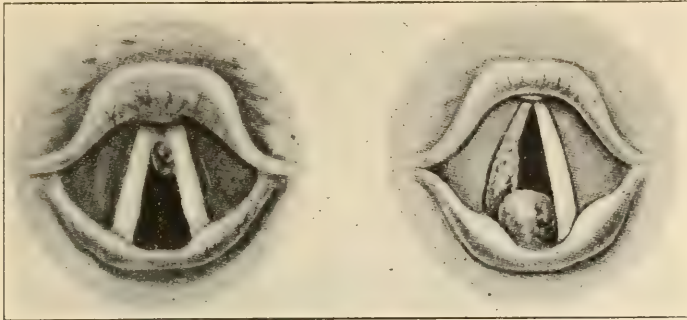


FIG. 22.—Angioma of left vocal cord. (Horn and Möller.)

FIG. 23.—Angiomata of right false cord and interarytenoid region. (Hamilton White.)

Small growths may be removed endolaryngeally by the snare or forceps, or, if the tumor is very flat, it may be destroyed by the galvanocautery. Whether or not tracheotomy should be done as a routine is a matter of dispute, Vitto-Massei recommending this procedure, while Chiari advised that it should only be done as a last resort in otherwise uncontrollable hemorrhage. Moore, himself, advises tracheotomy where endolaryngeal removal is attempted by the suspension apparatus.

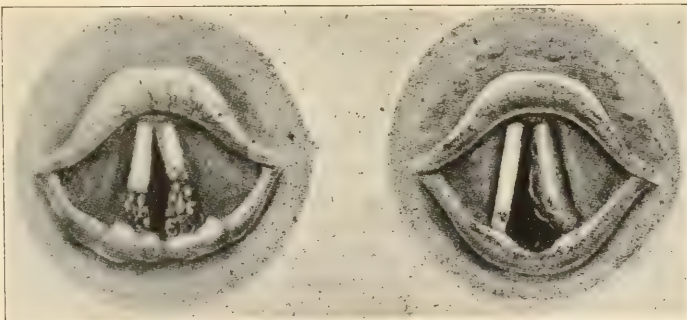


FIG. 24.—Bilateral angiomata. (Ryerson.)

FIG. 25.—Angioma of left false cord. (Emil Mayer.)

Radium has been applied with success by Ryerson, and by New and Clark¹ who believe it is a specific for true vascular growths of the larynx, though the mixed and fibrous types do not respond nearly so well.

¹ *Annals of Otology, Rhinology and Laryngology*, 1919, 28, 1025.

The Chief Cause of Chronic Laryngeal Stenosis, according to Chevalier Jackson,¹ is improperly performed, or high, tracheotomy. He deplures the fact that in over thirty text books examined, high and low tracheotomy is taught, with the inference that the former is the easier in emergency and therefore safer, and without pointing out the subsequent dangers of this type of operation. In thirty years laryngeal work he has never been without cases of laryngeal stenosis due entirely to this cause. The cases have come to him because the surgeon was unable to decannulate his patients owing to an insufficient airway remaining in the larynx after the acute laryngeal stenosis had subsided; in other words, an acute laryngeal stenosis (edema, diphtheria, etc.) requiring tracheotomy had been followed by a chronic laryngeal stenosis which prevented removal of the cannula after the acute condition had subsided. In a small proportion of the cases, there had been necrosis of the cartilaginous framework of the larynx, probably due to the primary condition for which tracheotomy was done, but in the remaining five-sixths the chronic stenosis was due to faulty tracheotomy or improper after-care. In a series of over 100 cases performed by the Jackson technic, not 1 case of chronic laryngeal stenosis resulted. Tracheotomy is wrongly taught and the worst done of all operations, and perhaps the only one that has not been raised to its proper modern plane. His experience shows plainly that high tracheotomy should never be done, and that the proper technic of after-care is unknown.

The tracheotomic causes of laryngeal stenosis may be classified under eight heads:

1. Hasty operation.
2. Attempts at general anesthesia.
3. High tracheotomy, even when classically done.
4. Division of the cricoid cartilage.
5. Sewing up of the wound.
6. Improper postoperative care.
7. Wearing of a cannula of improper size, shape, or material, or one with a fenestrum.
8. Neglect of ordinary, decent cleanliness in the wearing of the cannula.

All of these causes are discussed in detail.

Hasty operation is the result of postponing the operation too long, or of attempting to give a general anesthetic which precipitates arrest of respiration. This results in a high operation because the upper part of the trachea is more superficial and therefore is considered more easily reached. The text-books teach this. As a matter of fact the Jackson two-step, finger-guided operation is equally rapid and infinitely more safe. In a hasty operation, the trachea is frequently hacked, with islands of cartilage in the infected wound that become necrotic. If the ring-like support of the cartilage is lacking, subsequent cicatricial contractions are unresisted, and this constitutes one of the greatest difficulties for an ultimate cure. The stabbing operation, through the

¹ Surgery, Gynecology and Obstetrics, May, 1921.

cricothyroid membrane, is unjustifiable, but if any type of high operation is done, it should very soon, as soon as the patient is again in good shape, be followed by a deliberate low tracheotomy, the upper wound being allowed to close at once.

The Jackson two-step, finger-guided technic consists briefly in grasping the trachea firmly with the thumb and third finger of the left hand, with the patient's head exactly in the mid-line. This immobilizes the trachea and pushes aside the important vessels and nerves on each side. The entire front of the neck is now split open with a single incision directly to the trachea. The index finger, hitherto unemployed, feels the corrugations of the trachea in the pool of blood and guides the knife to its incision by sense of touch instead of sight. The primary incision is made from the thyroid cartilage to the suprasternal notch, and the trachea opened not higher than the second ring. Bleeding vessels are finally quickly caught and tied, and a few coughs, the patient being unanesthetized, quickly clears the air passages.



FIG. 26.—Boy, aged three years. The upper scar shows the site of the tracheotomy through the larynx that resulted in laryngeal stenosis. Below the scar is seen the cannula fistula in its proper place, in the suprasternal notch. This second tracheotomy was done as the first step in the cure of the laryngeal stenosis. (Jackson.)

To give an anesthetic of any kind is an error. All anesthetics are respiratory paralyzers and endanger the life of a dyspneic patient, since he loses the aid of the accessory muscles of respiration on which he has been depending. Moreover, they paralyze the cough reflex—"the watch-dog of the lungs" and permit the entrance of potentially dangerous infectious materials.

Injection of the trachea with cocaine is objectionable for the same reason. It abolishes the cough reflex and gives, to be sure, the "tranquil tracheotomy" of Greene and St. Clair Thompson, but Jackson contends that the cough is exactly what is desired and needed.

Of 170 cases of laryngeal stenosis observed, 158 had been "high" tracheotomies; 32 having been done through the cricothyroid membrane and the thyroid cartilage itself were really laryngotomies.

The chief reasons that high tracheotomies result in stenosis are:

(a) The larynx and subglottic region are narrower than any other portion of the airway.

(b) The subglottic tissues, especially in children, are intolerant of contact, and the wearing of a cannula in this position causes prolonged inflammation and cicatricial contraction, ending in stricture.

(c) "High" tracheotomy usually means, in practice, division of the cricoid cartilage, the only complete ring-like support to prop open the lumen of the laryngeal airway. This should never be cut, and it is better never to incise the first ring either, since the inevitable inflammatory reaction from mixed infection leads to infiltration of the adjacent subglottic tissues and consequent narrowing of this, already narrow, part of the airway. Moreover, prolonged wearing of the cannula in this region will result in a larger, more intractable spur formation on the posterior tracheal wall, than when the opening is lower down. The author has never seen a case of chronic laryngeal stenosis due to a low tracheotomy.

"The after-care seems to be less understood than anything else in surgery." The wound should be dressed *every hour*, at least, so as to get rid of secretions that otherwise may lead to infection. Bacteria will be washed away by the flow of serum if the dressings are renewed often. The wound should be left wide open and not sutured up to the cannula. There is a tendency to slow union of the divided tracheal cartilages. This union is always fibrous. The wound in preliminary temporary tracheotomies should be kept open with packing until this fibrous union has taken place and the granulations, which fungate into the trachea, have become epithelialized. In cases in which the cannula is to be worn, the wound should be kept open until the divided ends of the tracheal cartilages are covered with epithelialized granulations. The inner cannula should be cleaned hourly, or oftener if obstructed. The outer cannula should be removed at least once a day, cleansed, smoothed, polished, sterilized and fitted with clean tapes. A duplicate cannula is therefore necessary. The cannula must be of the proper size and shape for the given condition. A proper cannula has little tendency to result in the localized fibrosis that causes stenosis. A badly fitting one, rough, made of aluminum or rubber, or with the utterly useless fenestrum, will cause stenosis. Fenestra are useless because the properly sized cannula, equal in area of cross section to that of the average normal glottis, will have room around it in the trachea for an ample by-passage of air. As the normal tracheal area of cross section is more than double that of the normal glottis, it is unnecessary to have a cannula of more than half the area of cross section of the trachea. An over-sized tube causes much future trouble. Tubes are often worn unnecessarily long because the surgeon is unfamiliar with the partial corking method of weaning the child away from its cannula.

Jackson's summary is quoted entire:

1. The most frequent cause of chronic laryngeal stenosis is high tracheotomy.

2. While in a given case no one has any right to say that the operation

that saved that patient's life was an unjustifiable one; yet, equally rapid methods being available, high tracheotomy should not be *taught*.

3. The classic distinction between a high and a low tracheotomy with reference to the isthmus of the thyroid gland is a relic of the days when too much respect was had for the thyroid gland, or at least for its isthmus, and the distinction should be abandoned. The vitally important matter of where the trachea should be incised should not depend upon the negligible isthmus. There should be taught only one tracheotomy and that should be low.

4. The trachea should always be incised lower than the first ring except in those rare cases in which laryngoptosis renders this impossible without entering the anterior mediastinum.

5. The cricoid cartilage should never be cut unless laryngoptosis places all the rings of the trachea below the upper border of the manubrium, which would require entering the mediastinum if the rule were to be followed.

6. The tracheotomic causes contributing to chronic laryngeal stenosis are:

- (a) High tracheotomy.
- (b) Hasty operation.
- (c) Attempts at general anesthesia.
- (d) Cutting of the cricoid cartilage.
- (e) Hacking the trachea by several incisions instead of one.
- (f) Denuding the tracheal cartilages of perichondrium with resultant necrosis.

(g) Suturing the wound.

(h) Prolonged wearing of a cannula that is of improper size, shape, or material, such as rubber or aluminum, or one with a fenestrum, or one without a pilot.

(i) Neglect of proper after-care. The keynote of the after-care should be that it is a plumber's job; the "pipes," natural and instrumental, must at all times be kept clear.

7. If in an emergency a high incision of the trachea has been made, a cannula should not be worn in it. As soon as the patient's breathing has been resumed a low incision should be made and the cannula should be inserted therein.

Peroral Endoscopy. Although the study on DIVERTICULA OF THE ESOPHAGUS, as here given, was made by a general surgeon as an aid to an external operative approach for this condition, it is of interest also to peroral endoscopists who may attempt the Mosher internal method of obliterating the pouch. Bevan's¹ ingenious and highly successful external operation does not concern us here but may have its place elsewhere in these volumes.

Pulsion diverticula of the esophagus, like inguinal hernias, always occur at exactly the same spot. In a hernia this is the external abdominal ring, and in diverticula it is the junction of the esophagus and the pharynx in the median line posteriorly. At this point there is a tri-

¹ Journal of the American Medical Association, January 29, 1921.

angular area where the oblique muscles of the pharynx and the transverse circular muscles of the esophagus meet, leaving a small area not covered with musculature but simply by a subcutaneous layer. Where a diverticulum develops there is probably more than the normal weakness at this point, possibly a congenital absence of muscle fiber over a wide area, permitting a pushing out of the esophageal wall (mucosa and submucosa) in the process of deglutition, which eventually forms the pouch. The neck of the pouch nearly always remains small, though the sac itself may hold even 10 or 12 ounces. As it always develops at this

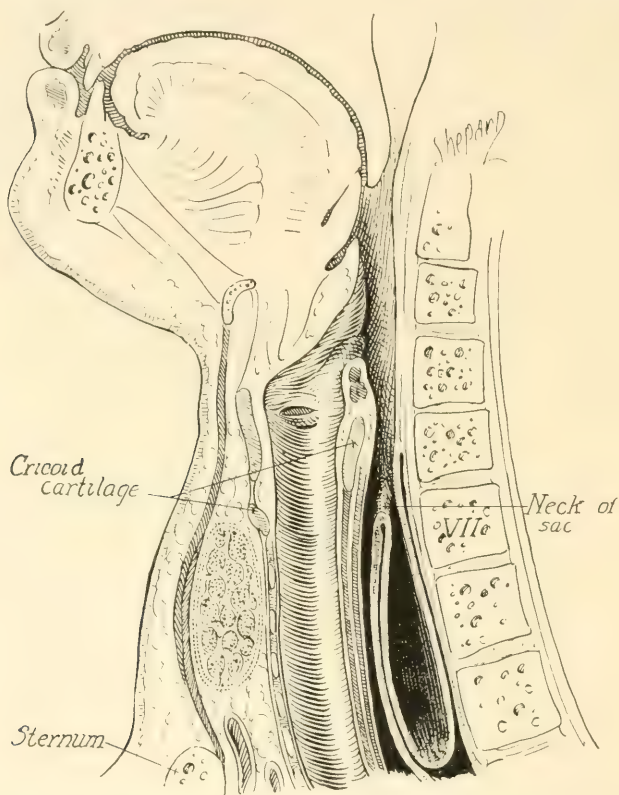


FIG. 27.—Sagittal section of neck, showing anatomic relations of hernial sac. (Bevan.)

point, it occupies a position in the middle line behind the esophagus and in front of the vertebral column as shown in Fig. 27.

Traction diverticula are of different origin, and may occur at any point, as they are usually caused by cicatricial contraction of some old inflammatory process drawing the wall of the esophagus outward and making a more or less funnel-shaped diverticulum.

Small pulsion diverticula cause little trouble beyond slight discomfort in swallowing and at times some regurgitation. They produce no serious impression on the patient's health. A diverticulum of large size,

however, may be a serious menace to life. As they increase in size, the danger increases from their decomposing contents, and as food passes more readily into the diverticulum than into the esophagus, the patient may die of starvation, if not relieved by operation. In small diverticula, causing little inconvenience, the patient may be safely left alone until symptoms become more pressing, but in the severer types, operation of some sort is indicated.

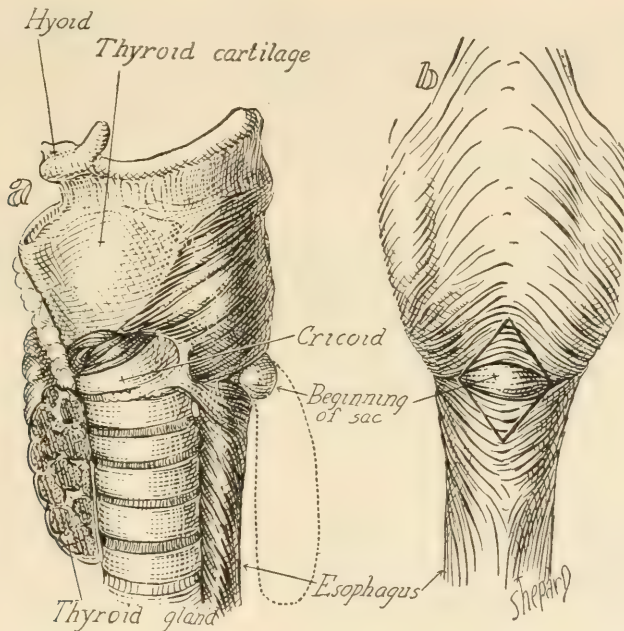


FIG. 28.—Anatomic relations. (Bevan.)

Jackson¹ again protests against the unrestricted sale of lye and similar caustics, with little or no warning as to their dangerous nature. In his extensive experience in the Bronchoscopic Clinic in Philadelphia, he has seen many cases of stenosis of the esophagus following the swallowing of caustic alkalis. The case illustrated is a graphic one and represents many others. He finds that not one of the caustic alkalis sold in the grocery stores for cleansing purposes, bears a sufficient warning of its dangerous nature. Poisons sold by druggists to the laity are subject to legal regulations as to labelling, and such drugs go into the medicine cabinet, while these caustics (lye) sold by the grocer go into the kitchen. The frequency with which these lye-strictures are encountered, as well as their dangerous nature, leads Jackson to think that some remedial legislation is necessary so that all who buy these corrosive poisons shall be sufficiently warned of their contents by a conspicuous label.

Any article on endoscopy must naturally be concerned largely with

¹ Journal of the American Medical Association, July 2, 1921.

the work of Chevalier Jackson and this is no deviation from the rule. He is continually accomplishing things formerly considered impossible and pointing the way to fresh endeavor. This abstract deals with his *removal of safety pins from the stomach* without anesthesia.¹ Two cases are reported. In the first two, large closed safety pins, linked together, were removed, endoscopically, from a six months old child after a sojourn of twenty-seven days. There were no symptoms but they were located

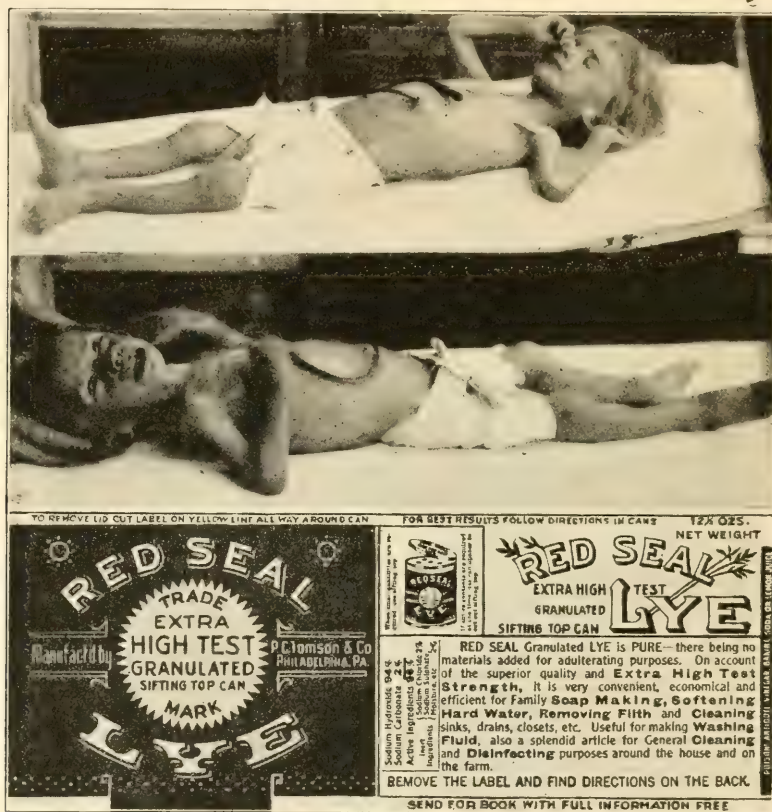


FIG. 29.—From a photograph of a child fatally burned by swallowing Red Seal Lye. The lower part of the illustration shows the inadequacy of the warning common to all labels by lye containers sold in groceries and used in kitchens. Parents are not aware of the danger of leaving the lye preparations in the reach of children. This label is removable to get at the directions on the back, and removal usually destroys or removes the tiny, inconspicuous, vertical cautionary wording. (Jackson.)

and watched by roentgenographic studies. It was decided that they formed a body too large to pass the pylorus, as usually happens in about three days, and they were removed in twenty-six minutes by mouth.

Case 2 is unique, due to the fact that an open safety pin in the stomach of a twelve months old child was eventually regurgitated into the esophagus, point downward, where its presence gave rise to pyrexia

¹ Journal of the American Medical Association, February 26, 1921.

and vomiting, which disappeared shortly after its removal in fifty-nine seconds. The pointed end of the pin was buried up to the spring in the anterior wall of the esophagus and directed towards the pericardium so that any rough manipulation, driving the point further downward, would have resulted disastrously. The hyperpyrexia (105.8° F) indicated an infected process, but the rapid fall in temperature after the removal of the pin would seem to indicate that pus had not been formed. Recovery from such a condition is exceedingly rare.

Jackson's conclusions are that:

1. In most cases, foreign bodies that have reached the stomach spontaneously (*i. e.*, without being pushed down) will pass out harmlessly through the intestinal tract.

2. There are a sufficient number of exceptions to this rule to render imperative the necessity of watching the foreign body by a skilled fluoroscopist at frequent intervals until the intruder is recovered from the stools.

3. During the watchful waiting period, no change from the usual diet should be made and laxatives should not be given.

4. There are a number of cases in which an open safety pin has passed by rectum; but in view of the cases herein reported, removal from the stomach is advisable in two classes of cases; (*a*) those in which the pin is of such large size relatively to the patient that the opinion that it will not pass is warranted, and (*b*) those in which a watchful waiting period for a number of weeks, say three to eight, has demonstrated that the foreign body is unlikely to pass.

5. Regurgitation of a foreign body from the stomach is so exceedingly rare that it is not to be waited for.

6. The safest and best method of removal of foreign bodies from the stomach is by peroral gastroscopy, provided an experienced endoscopist is available. Otherwise, external operation by a skilful surgeon is safer and more successful. No anesthetic, general or local, is required for gastroscopy. In the case of a large number of foreign bodies in the stomach of the insane, probably external operation is a preferable method of removal.

7. The aid of the highest skill of the best roentgenologist is imperative in the study of these cases.

8. According to the experience of the Bronchoscopic Clinic, the foregoing principles apply to foreign bodies other than safety pins.

Taylor¹ calls attention to a type of FOREIGN BODY IN THE AIR PASSAGES which seems to have been neglected in the literature although, in the South at least, it is a not uncommon accident. He finds that in Florida, where the sand spur is indigenous and most abundant, it is a frequent intruder in the air passages, although in most instances it is stopped by the larynx. Out of 85 cases gleaned from the literature, in only 7 had the sand spur invaded the trachea or bronchi.

Jackson² most ably reviews the *Symptomatology and Diagnosis of*

¹ Journal of the American Medical Association, August 27, 1921.

² Transactions of American Laryngological, Rhinological and Otological Society, 1920.

Foreign Bodies in the Air and Food Passages, based upon his study of 789 cases in the Bronchoscopic Clinic. Hitherto the relative rarity of the cases in the experience of any one observer has prevented systematic study, but now a vast amount of symptomatological material has accumulated and additional data have been gleaned sufficient to establish a definite working basis. Only the summary of the chief points in symptomatology and diagnosis can be presented here but the monograph is a wonderful and complete study of the subject.

LARYNX.

1. Foreign bodies lodged in the larynx cause an initial laryngeal spasm which is followed by more or less laryngeal wheezing, croupy cough, and a variable degree of impairment of phonation.

2. Pain in the laryngeal region may be present and is sometimes referred to the ears.

3. The larynx may tolerate a thin, flat foreign body for a relatively long period of time, but the development of increasing dyspnea renders early removal imperative in the majority of cases.

TRACHEA.

4. Tracheal foreign bodies are usually movable and their movements can usually be felt by the patient.

5. The vibrations may be palpated and heard with the stethoscope.

6. Cough is usually present at once, may disappear for a time and recur, or may be continuous, and may be so violent as to induce vomiting.

7. Sudden shutting off of the expiratory blast and phonation during paroxysmal cough is almost pathognomonic of a movable tracheal foreign body.

8. Dyspnea is usually present and is due to the bulk of the foreign body plus the subglottic swelling caused by the traumatism of the shifting of the intruder.

9. The asthmatoïd wheeze is usually present and is often louder and of lower pitch than the asthmatoïd wheeze of bronchial foreign bodies. It is heard at the mouth, not at the chest wall.

10. Pain is not a common symptom, but may occur and be accurately localized by the patient.

BRONCHI.

11. Initial laryngeal spasm is almost invariably present with foreign bodies of organic nature, such as nut kernels, peas, beans, maize, etc.

12. A diffuse purulent laryngo-tracheo-bronchitis develops within twenty-four hours in children under two years.

13. Fever, toxemia, cyanosis, dyspnea and paroxysmal cough are promptly shown.

14. The child is unable to cough up the thick mucilaginous pus through the swollen larynx and may "drown in its own secretions" unless the offender be removed.

15. Lung abscess rapidly forms.

16. The older the child the less severe the reaction.

17. In the early stages an acute obstructive emphysema is present, manifested by: (a) Limited expansion, (b) muffled tympanitic percussion note, (c) markedly diminished or absent breath sounds on the obstructed side, (d) many rales and harsh breathing on the free side.

18. The radiograph confirms these signs by showing (a) greater transparency on the obstructed side, (b) displacement of the heart toward the free side, (c) depression and limitation of the diaphragmatic movement on the obstructed side.

Symptoms of prolonged foreign body sojourn.

BRONCHI.

19. The time of inhalation of a foreign body may be unknown or forgotten.

20. Cough and purulent expectoration ultimately result although there may be a protracted delusive symptomless interval.

21. Periodic attacks of fever, with chills and sweats and followed by increased coughing and the expulsion of a large amount of purulent, usually more or less foul material, are so nearly diagnostic of foreign body as to call for exclusion of this probability with the utmost care.

22. Emaciation, clubbing of the fingers and toes, night-sweats, hemoptysis, in fact all of the symptoms of tuberculosis are in most cases simulated with exactitude, even to the gain in weight by an out-door regimen.

23. Tubercle bacilli have never been found in the Bronchoscopic Clinic associated with foreign body in the bronchus. It was the only element lacking in a complete clinical picture of advanced tuberculosis. A point of difference was the rapid recovery after removal of the foreign body.

24. The erroneous statement in all of the text-books that foreign body is followed by phthisis pulmonalis is an heirloom of the days when the bacillary origin of true tuberculosis was unknown, hence the foreign body phthisis pulmonalis or pseudotuberculosis was confused with the true pulmonary tuberculosis of bacillary origin.

25. The subjective sensation of pain may allow the patient to localize a foreign body accurately.

26. Foreign bodies of metallic or organic nature may cause their peculiar taste in the sputum.

27. Offensive odored sputum should always suggest bronchial foreign body; but absence of sputum, odorous or not, should not exclude foreign body.

28. Sudden complete obstruction of one main bronchus does not cause noticeable dyspnea provided its fellow is functioning.

29. Complete obstruction of a bronchus is followed by rapid onset of symptoms.

30. The pleura is rarely involved. Rib resections done for supposed empyema have, with one exception, shown no pus.

31. The physical signs usually show limitation of expansion on the affected side, impairment of percussion, and lessened transmission or absence of breath sounds distal to the foreign body.

32. The "asthmatoïd wheeze" may, if present, be of great diagnostic value. Its absence, however, does not negative the presence of foreign body.

33. All cases of chest disease should have the benefit of a radiographic study to exclude bronchial foreign body as an etiological factor, and negative opinions should never be based upon any plates except those of the utmost perfection that the wonderful modern development of the art and science of roentgenology can produce. In doubtful cases, the negative opinion should not be conclusive until a roentgenologist of long and special experience in chest work has been called in consultation. Even then there will be an occasional case calling for diagnostic bronchoscopy.

34. Symptoms of pulmonary abscess, or other lung disease, even cough, following within a few weeks of the extraction of teeth, call for the exclusion of foreign body in the lung.

ESOPHAGUS.

35. There are no absolutely diagnostic symptoms of esophageal foreign body.

36. Dysphagia, however, is the most constant complaint, varying in degree with the size of the foreign body and the degree of inflammatory or spasmodic reaction produced.

37. Pain may be caused by the penetration of a sharp foreign body, by inflammation secondary thereto, by impaction of a large object or by spasmodic closure of the hiatal sphincter.

38. The subjective sensation of foreign body is usually present but cannot be relied upon as assuring the presence of a foreign body for it is present for a time after the passage of the intruder.

39. All of these symptoms may exist, often in most intense degree, from previous violent attempts at removal and the foreign body may or may not be present.

40. Fluoroscopic study of the swallowing function with barium mixture or capsule will give the location of a foreign body which may not be radiopaque.

41. Antero-posterior and lateral reontgenograms should always be made.

42. The value of a radiograph after the removal of the foreign body cannot be too strongly emphasized.

STOMACH.

Foreign body in the stomach ordinarily produces no symptoms. The roentgenogram and the fluoroscopic study with an opaque mixture are the chief means of diagnosis.

Under the title of **Prognosis of Foreign Body in the Lung**, Jackson¹ says that while the older text-books state that if the intruder is not removed, death usually results from phthisis pulmonalis, in his experience this has never proved so and in no case have tubercle bacilli been found. The clinical picture, in long standing cases, is often identical with that of tuberculosis, but when the foreign body is removed, all symptoms, due to the prolonged pulmonary sepsis, almost invariably disappear and the patient recovers perfect health.

The prognosis is materially influenced by the character of the intruder. Both the rapidity and extent of the pathological condition are dependent on the degree of the obstruction to drainage and aëration of the tributary lung tissue, and on the reaction the tissues manifest to the presence of a particular foreign body. Some substances, such as peanut kernels, are very irritating to the mucosa, while metallic bodies cause little specific reaction, or may even be assumed to give off germicidal agents, that lessen suppuration. A smooth, dense, insoluble, inorganic substance causes no trauma and little reaction for a long time, while a sharp, ragged fragment causes trauma that may, within a few weeks, cause serious consequences.

In the case of foreign bodies, such as bullets, that have entered the lung through the chest wall, it is deemed better to attempt peroral removal than to wait for abscess formation and extraction by thoracotomy, the prognosis of which is always grave. One such case is reported, where radiographic studies showed the location of the bullet to be anterior to the larger vessels. Before attempting removal, preparations were made to control possible hemorrhage by endobronchial tamponade, which was considered to be quite feasible since respiration from the middle and upper lobe, and the other lung would be uninterrupted. It was proposed also, in case of necessity, to cause collapse of the lung by artificial pneumothorax. Neither of these procedures was resorted to as the bullet was extracted through the bronchoscope, under guidance of a double plane fluoroscope, and by perforating healthy lung tissue, in thirty-five minutes, without any bleeding at all. At a preliminary bronchoscopy, the tissues that were to be transversed beyond the wall of the bronchus were pinched with forceps, thus probably producing clotting in and obliteration of the smaller vessels, and this preliminary operation is thought to have had a material influence on the control of hemorrhage. This is the first case of its kind to be reported.

Endoscopy of the bronchi is considered to be perfectly safe when carefully done, but an enormous element of risk arises as soon as a bronchial wall is broken through. Any foreign body that has gone down the natural passages can be brought up the same way without traumatizing the bronchial wall.

1. The prognosis of unremoved foreign body in the lung is grave.
2. About 2 per cent of foreign bodies are coughed up, and in these cases the prognosis is good; but this fortunate termination is too rare to justify waiting, in view of the fact that bronchoscopy is 98 per cent

¹ Journal of the American Medical Association, October 8, 1921.

successful. As between thoracotomy and waiting for spontaneous expulsion that may never happen, the prognosis of the latter course is less serious.

3. The prognosis of thoracotomy for removal of aspirated foreign bodies, so far as can be determined, is extremely grave. For penetrating foreign bodies, it is so grave as to be inadvisable unless suppuration has intervened.

4. The prognosis as to bronchoscopic removal of aspirated foreign bodies is very good (98 per cent removals). It may be said that almost any localizable foreign body that has gone down the natural passages can be brought up the same way. The prognosis as to recovery after removal is excellent (98.3 per cent recoveries). Of 44 cases complicated by abscess or bronchiectasis, in 42 (94.4 per cent) the patients recovered good health. The risks of a very brief and careful bronchoscopy without general anesthesia are almost *nil*.

5. The prognosis in case of a penetrating foreign body removed from the lung by bronchoscopy through the mouth, based on the only case so far thus dealt with, is good. The patient had no hemorrhage, no rise of temperature, was discharged cured three days after the bronchoscopy, and is still in perfect health. A large series of cases will be required to determine the prognosis. The method is necessarily limited to foreign bodies whose smallest diameter is less than that of the main bronchus of the invaded lung. It can be considered justifiable only after careful localization studies by lung-mapping in the particular case; otherwise fatal hemorrhage may be encountered.

Jackson¹ further believes that there are no fixed limitations to the peroral bronchoscopic removal of foreign bodies in the lungs and that the bronchoscopic failures of ten years ago are no criterion for the peroral bronchoscopy of today. If mortality be avoided, patient concentrated work with rubber tube manikin, dog and cadaver will eventually solve any problem of bronchoscopic removal of any localizable foreign body of appreciable size. Obviously a small piece of pneumoconiotic material or a very small fragment of peanut kernel may get into a tiny branch bronchus and therefore may not be localizable.

THE EAR.

Deafness. Scheible² has noted certain types of deafness frequently found associated with gout. One type is of sudden onset, usually unilateral, characterized by dizziness, tinnitus and raising of the low tone limit. This he thinks due to an auditory nerve involvement. In the second group there is no vertigo, but tinnitus is often a prominent symptom, and the deafness is most marked in noisy places or where a number of people are talking. High tones are frequently poorly heard. Certain of these gouty patients, who heard normally in a quiet room, when tested in the presence of a loud noise, heard only about one-quarter as well as patients possessing normal hearing when similarly tested.

¹ Laryngoscope, July, 1921.

² Münchener medizinische Wochenschrift, November 5, 1920.

The acute onset and unilateral involvement suggest the deposition of urates in the ossicular articulations, while the gradual lowering of the high tone limit in the second class suggest a degenerative process due to deranged metabolism. In neither class was a tendency noted for the deafness to progress to extremes.

During the last few years there has been active propaganda on the part of otologists and among the deafened themselves, through their clubs and leagues, to ameliorate the condition of those suffering from impaired hearing, and Hays¹ has done his share of this commendable work. In this article he lays stress on the need for, and possibility of, the prevention of deafness during early life. Of course, nothing can be done in a preventive way for those congenitally deaf, and but little for hereditary deafness, except possibly by preventing the marriage of those who are likely to produce deaf children (see *PROGRESSIVE MEDICINE*, March, 1921). Much, however, can be done in a preventive way for the class of acquired deafness.

The prophylaxis outlined by Hays includes attention to the child's general health and the institution of such measures as may be necessary to bring the poorly nourished or developed child up to par. This is accompanied by nose and throat hygiene, *i. e.*, keeping the nose and throat clean by the instillation of mild alkaline solutions and soothing oils, with a medicine dropper. There should be no question that the speedy removal of tonsils and adenoids is indicated on the first sign of developing ear trouble. This procedure does not insure against the future development of progressive deafness, for sometimes the Eustachian tubes become so widely open that improper blowing of the nose may bring about what Hays refers to as "pocket handkerchief deafness," namely an atrophic and relaxed condition of the drum that may be beyond repair when first noted. The child should be taught to blow with only one side of the nose closed, and if, in spite of this precaution, the ears are forcibly inflated, both sides of the nose should be kept open during the act of blowing. This principal is applicable to all adults as well. Adenoids in the infants should be removed when of sufficient size to interfere with breathing or feeding, and also the small adenoid masses in the fossæ of Rosenmüller, for it is this later condition that frequently leads to progressive deafness in later life, may be long after the original cause of trouble has undergone atrophy. If diseased tonsils are left in position until deafness is noticeable, their removal may, or may not, arrest the process. It is well, therefore, always to be on the watch for early signs of ear trouble. Tonsillectomy is, as a rule, not resorted to before the end of the second year of the child's life, but if suspected of causing trouble, the tonsils should be removed irrespective of age.

More attention should be paid to the evanescent earaches of childhood as they are real warnings of the beginning of future serious trouble. Hearing should be tested in all such cases and, if found in the least impaired, remedial measures should be started at once. These consist in those outlined above, with the addition of careful inflation and gentle

¹ Journal of the American Medical Association, July 23, 1921.

massage. Particularly after any suppurative condition should the hearing be tested, as in many such cases it is more or less impaired and will be the cause of serious deafness in later life. Many cases of progressive deafness in adults date back to the uncared for suppuration following the exanthemata, where the suppuration ceased but the damaged hearing function was neglected. Causative factors, whether in the nasopharynx or in the sinuses must be eliminated, and drum perforations must be properly closed. So long as there is a pulsating middle ear discharge, there is always the possibility of mastoid involvement, and of permanent and irremediable damage to hearing. If the suppuration continues for any length of time, it is considered *prima facie* evidence of mastoid involvement calling for exenteration of the diseased mastoid structure. If this rule is followed, much future deafness will be avoided.

In scarlet fever and measles, after the acute inflammation has subsided, the impairment of hearing is often so slight as to escape notice, but certain adhesive processes remain that, unless cared for, will surely cause trouble later in life. Every child should be carefully tested immediately after the termination of his contagious condition.

Hays recommends the careful routine examination of all school children's ears by competent specialists, and the establishment of a clinic in the school itself for the care of those defectives discovered, in order that undue time may not be taken from study. This hardly seems a feasible plan in view of the very large number of specialists who would be required to do the work. Particular attention should be directed towards the proper seating in class-room of these defectives, or, if two far advanced, they should be sent to special schools for the hard-of-hearing.

Downey¹ has brought forward a DIAGNOSTIC SIGN IN PROGRESSIVE DEAFNESS that he finds also of prognostic value. It consists in introducing an electrically lighted otoscope, with the attached bulb held collapsed snugly into the external auditory meatus, the instrument clearly showing the membrana flaccida and the manubrium. As the bulb is allowed to fill slowly with air, the drum is carefully observed.

1. If an immediate congestion is produced, so that a network of small arteries can be easily traced in the superior-posterior canal wall, in the flaccid membrane and in the manubrial plexus; and if the hyperemia can be markedly increased by a few seconds of gentle massage, the pathological process is probably one with little or no circulatory disturbance. Inflation and massage are beneficial in this class of cases.

2. If no hyperemia follows this experiment, the disease present is probably true otosclerosis with beginning ankylosis of the stapedial articulation, spongifying of the bony labyrinthine capsule and actual arterial change of a sclerotic nature. Massage and inflation in such cases are *not* beneficial and may be actually harmful.

If no tympanic congestion is produced, the hearing and vestibular tests usually show a reduction in function of both the cochlea and static labyrinth. It is assumed from these clinical observations that changes

¹ Laryngoscope, March, 1921.

in the external arteries of the tympanic membrane, as shown in this manner, are significant of similar changes in both the tympanum and the labyrinth as there is a free anastomosis between these vascular networks.

Numerous substitutes, many electrically operated, have been suggested for the "Larm-Apparat" of Barany. Most of them are ineffective or too complicated. Shapiro¹ offers a modification of an earlier suggestion that has at least the merit of simplicity, universal application and ease of operation. It should in addition, I think, prove effective. A small hole (about $\frac{1}{16}$ inch) is cut with scissors in the wall of an ordinary diagnostic tube, near one of the tips. This tip is inserted into the patient's external meatus, while the assistant blows into the other end. Changeable, sterilizable mouth-pieces may be used in practice, as it may be necessary at times to have the patient do the blowing. Perfectly painless deafening is said to occur as long as the blowing lasts, and hearing is immediately restored when the blowing ceases.

Fowler² has demonstrated experimentally, using glass models of middle ears and drum membranes of various strengths, elasticities and tensions, that plus or minus pressures in the middle ear may be accurately determined by the use of anëroid barometers connected with the distal side of the drum. This method has been applied with success to human ears, and in a large proportion of the cases studied no abnormal pressures, either positive or negative, were demonstrable, although the usual interpretation of the otoscopic and inflation findings presented evidence of such abnormal pressure.

On the other hand, in cases where the Eustachian tubes showed patency to even gentle inflation, vacuæ of 10 to 15 mm. Hg. in the middle ear were observed, which demonstrates the inaccuracy of our present methods of diagnosing tubal closures and calls attention to the valve-like action of the tube with slight negative pressures in the middle ear. This also illustrates the necessity of restoring tubal function rather than tubal penetrability to inflation. Fowler has examined some tubes that were apparently impervious to air by all the usual methods of inflation and yet there were no vacuæ in the middle ears.

It has been demonstrated that negative pressures exceeding 20 mm. Hg. cannot occur because at about this figure obliteration of the tympanic cavity is caused by serum transudate or sucking together of the walls. Experimentally, collapse of the tubal walls prevents the causation of a greater vacuum than 20 mm.

Almost unbelievable amounts of plus pressure cause no pain, which is corroborated clinically by the fact that at times high pressure of exudate takes place painlessly. It is not the bulging of the drum *per se* in these cases that is the cause of the pain.

The otoscopic picture that is usually interpreted to mean middle ear vacuum is in reality often only a sign of long past processes, the malleus or drum remaining in the retracted position from shortening of the tensor tympani muscle, adhesive processes or simple redundancies.

¹ Laryngoscope, February, 1921.

² Annals of Otology, Rhinology and Laryngology, September, 1920.

Because of the habit of forcibly sniffing air through the nose in attempting to clear the nasopharynx of secretion, a negative pressure is often established within the middle ear due to collapse of the tubal walls, the subsequent air absorption increasing this closure. Gentle inflations may, however, suffice to reventilate these ears, unless continued repetition finally diminishes the resiliency of the tubes.

In these experiments, it was found that a negative Rinné could not be created by producing the ordinary plus or minus pressures in the middle ear, which would seem to indicate that drum hypertension cannot cause it. Even when hearing is markedly lessened by obstructive lesions, inflation may increase audition, whether the drum is hypotense or not, indicating that mobilization of the conducting mechanism is more important than drum tension.

Fowler,¹ in another communication, elaborates on the methods for the restoration of that tubal function which, as he has pointed out, is necessary for improvement in hearing. By restoration of tubal function he means the restoring and maintenance of the air balance on both sides of the drum membrane by the physiological passage of air through the Eustachian tube. It is usually easy to restore air balance temporarily but much more difficult to preserve this function on account of the degree of chronicity present.

The Eustachian tube is really a valve with its walls normally in apposition; when these walls, in normal cases, are forced apart by muscular action or by air pressure, a limited and gentle entrance of air takes place, disturbing the air balance in the middle ear so little as to be undetectable. Even slight negative air pressures operating from either end will more closely approximate the walls of the tube, so that more than normal effort is required to pull them apart. Swallowing results in primarily, though faintly, increasing and immediately thereafter, more extensively decreasing the density of the postnasal air. In blocked noses there is a great proportional difference between the positive and negative phases. If the tubes were not collapsible there would be constant disturbing air changes every time they opened, but as it is, the gradual opening and closing following gentle postnasal variations in pressure are normally not noticeable in the middle ear. In the home treatment of these cases of tubal obstruction, Nature's method should be closely imitated, by using just sufficient pressure to ventilate the passageway to the ear.

Fowler objects to the ordinary method of inflating the ears forcibly three times a week, contending that if there is a middle ear vacuum in even one-eighth of the twenty-four hours, the condition is not progressing favorably. The only way of counteracting this is by home treatment. Forcible methods of self-inflation such as those of Valsalva, Politzer and others are contraindicated, but the author's automatic, or balloon, inflator has been in use for years and has proved its value in maintaining approximately normal air balance. Benefit cannot be expected in all

¹ Transactions of American Laryngological, Rhinological and Otological Society; 1920.

cases because from disease, the degree of obstruction, or lack of power of the abductor tubæ muscles, sufficient patency cannot be obtained.

The ear inflator is modelled on the well-known "penny whistle" of childhood: a small rubber balloon mounted on a hollow wooden mouth-piece. In practice this mouth-piece is adapted to fit the nostril closely, the opposite nostril closed with the finger and the balloon distended by blowing through the nose to such a degree as may readily be determined by practice. At this point, the patient swallows, when the slight additional air pressure in the distended balloon will aid the normal condensation of air in the nasopharynx and gently, almost physiologically, inflate the ear. This may be done as often during the day as may be necessary to preserve the normal air balance (usually from two to twenty times).

In cases where the balloon is not sufficient to overcome certain degrees of obstruction of the Eustachian tube, Fowler presents an auxiliary method. He finds that to obtain overaction of the abductor muscles of the tube, it is only necessary to put the head well over on one shoulder with the face somewhat elevated and to swallow. In this position, the tube uppermost will open more easily. Sometimes this procedure alone will be sufficient, but in others the extra aid of the balloon will be necessary. With weakened drums, damage may be done by even this gentle method, unless some support is used. This support is readily obtained by plugging the ear, or pressing the tragus firmly into the external meatus at the instant of swallowing, which also aids inflation by a slight temporary increase in the middle ear pressure at the time it is of most service as an aid in opening the tube.

In the usual method of performing the RINNÉ TEST, according to Stefanini¹ the vibrations transmitted through the bone are those of the handle of the fork, while those transmitted through the air to the tympanum are those of the prongs. He thinks the test would be more accurate if the vibrations in both cases came from the same source. His method is to use the vibrations of the handle in each case, and to do so he attached a disk of wood to the handle. This disk, in turn had attached two pieces of metal of equal length and 4 mm. in diameter. One of these was connected with a rubber tube 1.4 meters in length, the end of which was placed in the external ear, while the other metal strip was placed on the mastoid. By experimenting with this machine, he discovered that the tragus tightly pressed into the external meatus transmitted vibrations from the fork handle for the same duration of time as when the rubber tube was used. His practical application, therefore, is to test bone conduction in the usual manner, and then to apply the handle of the vibrating fork to the tragus pressed against the meatus, which gives the truer extent of air conduction.

Gradenigo² finds this method reliable in normal ears but thinks that in pathological conditions the tragus does not act simply as a vibrating membrane for the transmission of vibrations through the air of the auditory canal, but that it has a power of transmission greater than the

¹ Archives Ital. di Otol. Rhinol. e Laringol. December, 1920.

² Ibid.

mastoid, by way of the auditory canal wall. In pathological conditions, this transmission along the walls prevails over transmissions through the air.

Emerson¹ has in recent years, advanced theories in regard to CHRONIC PROGRESSIVE DEAFNESS that have not received the universal approval of otologists but have stirred up much controversy and have many warm advocates. His histories, show that in many such cases the primary infection in the early beginning of the responsible focal process was the result of measles, scarlet fever, influenza or diphtheria. For a number of years following this primary infection the patient often suffers from a number of diseased conditions, probably dependent on renewed activity of the organism causing the original trouble. Such conditions which may cause deafness of focal origin may be in the sinuses, the vault of the pharynx, the tonsils or the teeth, and all suspected localities should be carefully studied by the *x*-ray. Submerged tonsils and carious teeth are most commonly found to be harborers of infection.

Emerson² believes that the *conducting apparatus plays a minor role in slowly progressive deafness*. In support of this view, he calls attention to the fact that in these cases the upper part of the scale is *always* lost first, and that this is accompanied by tinnitus denoting labyrinthine irritation. The tendency of the two ears to loose ground symmetrically is also significant; when the low limit has been raised to 512 C² it does not vary even a few seconds on either side. It does not seem plausible that the pathology of the Eustachian tube and middle ear could thus result in such equal loss of function. When fibrous bands found during the course of a nonsuppurative otitis media have caused fixation of the stapes, the perception apparatus has been functionally impaired long before the stapes has lost its motility. When this condition is accompanied by profound deafness, there is also a much more important associated perception deafness present so that one must look beyond the conduction apparatus for the real cause of progressive loss of hearing, there being, in the writer's opinion, no such thing as pure conduction deafness. In every case of deafness there is diminished tone perception from the beginning, and it is common knowledge that nerve deafness frequently follows acute or chronic systemic poisons. While it is, of course, true that inflammation in the middle ear causes loss of hearing, such involvement is considered to be secondary in importance to the question of damage, temporary or permanent, of the organ of Corti. In the case of adenoids and tubo-tympanic catarrh, the deafness is not due so much to the closure of the Eustachian tube *per se*, as to the resulting middle ear vacuum causing impaction of the stapes in the oval window and labyrinthine disturbance. This causes tinnitus and loss of tone perception in the upper part of the scale that is at first only functional, but is ultimately followed by nerve degeneration. The first part of this hypothesis can be made to agree with the views of Fowler, given above, but there is evidently a wide divergence of opinion in regard to the nerve degeneration. Emerson says that there is a continuous

¹ Rhode Island Medical Journal, January, 1921.

² Boston Medical and Surgical Journal, December, 1920.

loss in the upper tone limit if the loss of hearing is progressive and by the time the low limit has been markedly raised the upper limits have been much cut down, which would indicate that the progress of the deafness was not caused by increasing obstruction in the middle ear but by further impairment of tone perception.

While the primary step in these cases is usually a closure of the Eustachian tube causing intralabyrinthine changes and temporarily raising the low limit, the tube process may run its course, yet the deafness goes on, influenced by every acute exacerbation of a toxic focus. Hearing gradually tends to become the same on each side, the tinnitus becomes more high pitched and there may be vertigo. The loss of the upper register, whose lower limit is roughly indicated by the whispered voice, is considered *prima facie* evidence that the deafness is due to damage of the end organ. Inspection of the membrana tympani gives no information as to the function of hearing or any aid in prognosis.

Emerson thinks the original focus of infection is almost always to be found in the lymphoid tissue of the throat, and dating back to some of the infectious diseases.

Conclusions. 1. There is always a nerve element in every case of so-called conduction deafness of the progressive type.

2. The prognosis in regard to restoration of hearing is dependent upon the perception, and not upon the conduction, apparatus.

3. Toxic deafness and that due to beginning nerve degeneration cannot be differentiated by any aural examination.

4. Silent areas or islands of deafness are quite common in O. M. C. C.

5. The etiological factor is usually active in the lymphoid issue as a chronic infection with acute exacerbations.

6. In some cases of long-standing deafness it would seem necessary to reëducate the aural perception centers by exercises, after all sources of infection have been eliminated.

Emerson¹ further contends that marked changes in bone conduction are not necessary to establish the diagnosis of beginning nerve degeneration. Bone conduction may, indeed, be raised in the earlier stages of toxic nerve deafness in connection with hyperplastic otitis media. In support of his contention, he cites the well-known fact that the conducting mechanism may be all but destroyed, or there may be marked thickening and retraction of the drum, with good hearing, while often very poor hearing is found in cases with very few otoscopic findings of middle ear disease.

The treatment of these cases is largely limited to surgical removal of all foci of infection, and topical applications to the pharynx. Tonsillectomy is almost always indicated, even if apparently not causing trouble, as suggested by sore throat or the demonstration of pus. Tonsils causing toxemia are, however, accompanied by a low grade pharyngitis and perverted secretions. Removal of foci of infection can be expected to cause improvement in hearing where the actual nerve degeneration

¹ Annals of Otology, Rhinology and Laryngology, December, 1918.

has not advanced too far. Inflation or any other form of ear treatment is condemned as prone to make the patient worse. Applications to the tube are, at times practised with benefit.

For the detection of malingerers simulating unilateral deafness, Stefanini¹ proposes a test which differs from the Stenger in that only one fork is necessary. With the double tuning-fork test, both forks must be of exactly the same pitch and timbre, otherwise the trained ear might detect the difference between them. As it is not always easy to obtain such forks, Stefanini uses but one by attaching a rubber tube to the handle. The other end of the tube has an ear piece. To apply the test, the fork is set in vibration and the distance at which the patient begins to hear the sound with the normal ear is measured, the amplitude of the oscillations being also noted by means of the Gradenigo triangle. The rubber tube is now inserted into the supposedly deaf ear, and the tuning fork set in motion with oscillations of the same magnitude as before. The distance at which the normal ear hears sound is again measured and if the ear is really deaf, it will be the same as at the previous test. If the patient is malingering, it will be much less since when a sound reaches one ear, the other ear cannot perceive a sound of the same pitch and timbre unless it is more intense than the first. If the same sound reaches two normal ears in differing degrees of intensity, it will be perceived only by the one it strikes upon most intensely.

Leagues for the hard of hearing have been established in many of the large cities of the country. Their work, says Shambaugh,² begins where that of the otologist ends. This work is to ameliorate the condition of the deafened and to help the adult who is confronted with partial or complete loss of hearing. The first aid offered to help such patients solve their problems is the acquisition of lip-reading, while the social life of the clubs helps in reestablishing their morale. These leagues materially assist their members in solving economic problems, acquiring a less gloomy outlook on life, obtaining situations, and are, in general, great helps to the otologist.

Urbantschitsch³ believes in the VALUE OF METHODIC ACOUSTIC EXERCISES ON THE HEARING ORGAN OF DEAF-MUTES, as in this way the residual hearing which many of them possess can be conserved and developed. Careful examination has shown that large numbers of deaf-mutes have a surprisingly high percentage of residual hearing even among those thought to be totally deaf. This is ascribed to their inability to comprehend spoken language, having never acquired such understanding in the normal way of children with full hearing.

The method consists in repeating over and over in a sustained voice close to the patient's ear, at first simple sounds, such as the vowels, and indicating to the person which vowel is being used so that the sound, when heard, may acquire meaning. Simple, easily understandable words are next used, the patient being told in advance which word will be called, and the patient required to repeat them accurately to

¹ Archives Ital. di Otol., Rhinol. e Laringol., December, 1920.

² Volta Review, January, 1921.

³ Laryngoscope, July, 1921.

indicate his concentrated attention. Sentences come next, and while at first it is desirable to train with only one voice, later a number of different voices are used, as well as musical instruments. A patient who has learned to talk can practice with himself by means of a conversation-tube. This stimulates hearing perception.

Hearing perception in deaf-mutes is subject to much fluctuation, especially when these exercises are first instituted and all results may, at times, seem to have disappeared, but this is considered to be due to acoustic-fatigue and after a rest, or less strenuous practice, the hearing remnant always returns, usually increased. In order to avoid this condition and its attendant nervous manifestations, these exercises should only be given for five or ten minute periods several times daily. A psychological stimulus is created and even the acquisition of vowel perception is of great value in modifying the unpleasant voice of the deaf-mute.

Goldstein¹ goes into far greater detail in describing his methods of ACOUSTIC TRAINING FOR THE DEAF. In all important points he agrees with Urbantschitsch. Persistency of effort is required in this work as often it is only after weeks or months of patient, painstaking work on the part of the instructor that the perception of a harmonious tone, of a sustained vowel sound or of a word, is accomplished. When sound perception is once established, however, successive exercises progress with less difficulty. Even when the stage of word hearing is reached, numerous repetitions may be necessary before the pupil makes accurate response and before the word-image is definitely impressed. The dormant auditory mechanism must of necessity be slow of stimulation or of development and the delicate histological structures in the organ of Corti may have become so inert from disuse that at first little or no impression can be made, or until after repeated stimulation and re-education.

It is one thing to establish word-hearing; it is quite another thing to develop word-imagery. One is physiological; the other is psychological. Word-hearing depends on the accuracy with which the selective end-organ in the cochlea responds to sound combinations; word imagery is developed only when word-hearing has been associated mentally with the object or thing to which such word applies.

Otitis Media. It is generally accepted as a fact that at least 95 per cent of acute middle ear suppurations have their origin in inflammatory conditions of the nasopharynx with consequent blocking of the Eustachian tube mouths. Adenoids, says Leland,² are the responsible agents and prevent the pumping action of the tube from accomplishing middle ear drainage by interference at its pharyngeal opening. Leland, therefore, in acute suppurative middle ear cases, operates upon the adenoid masses in order to quickly restore this function of drainage, thus avoiding myringotomy in many cases. This method has the advantage of not requiring the after-treatment a myringotomy calls for, and the results are much quicker and more certain. Glogau was credited last year in PROGRESSIVE MEDICINE with a similar theory.

¹ Laryngoscope, July, 1921.

² Ibid., February, 1921.

When Leland sees an "acute middle ear" before rupture of the drum, even if the latter is bulging, he proceeds at once to operation. This must be done with a *curette* and with the sterilized, sharpened finger nail hardened in alcohol. It is done without an anesthetic and free bleeding with its deturgent action on the tube is encouraged. The curettement is followed by the administration of atropine or belladonna to diminish the circulation in the throat. Usually, when the case thus treated is of twenty-four or less duration, all tympanic inflammation immediately subsides. Even in cases of several days duration, favorable results are obtained. He considers it good practice to inflate the middle ear once or twice after inflammation has subsided, usually in four or five days, to prevent the formation of adhesions, and also to apply organic silver to the fossæ of Rosenmüller for the same purpose.

In the abortion of early cases of mastoiditis, the same procedure is carried out with the addition of multiple incisions of the drum membrane, under primary ether narcosis. As an after-treatment, the writer uses Wright's so-called "drawing solution" consisting of 1 per cent of citrate of soda with 4 per cent chloride of soda solution. This stops blood coagulation and induces rapid exosmosis. The incision is made through the posterior segment of the drumhead curving upward and backward on the bony wall of the canal down to the bone. Three other incisions are similarly made through Shrapnel's membrane, beginning at the posterior fold upward and outward, at the anterior fold and directly above the neck of the hammer. This causes free bleeding which must not be allowed to coagulate, since this will prevent sufficient drainage. To obviate this the canal is cleansed of all clots and immediately filled with warm "Wright's solution," which is pumped up and down with a cotton wound applicator to ensure its reaching the incisions. A light gauze wick, saturated in the solution is introduced and a large external pad applied. This pad rapidly becomes soaked with serum and must be renewed as often as this occurs. The wick is changed in twenty-four hours, and further bleeding encouraged by wiping the incisions if necessary. This tremendous welling outward of a large amount of lymph with its bactericidal power rapidly relieves the inflammatory symptoms in the mastoid.

Lillie¹ describes as TUBORRHEA that condition of the middle ear which often follows an acute suppuration and which is characterized by a persistent perforation and an almost continuous mucous discharge.

Many of these cases are directly due to an improper method of nose blowing as described by Hays above as a cause of "pocket handkerchief deafness." In the latter condition, the result is a relaxed and weakened drum, while in the former, as there is no middle ear air cushion and drum to prevent the passage of air up the tube, forcible blowing results in driving mucus directly into the middle and external ears. Indeed, many patients blow with that end in view as the easiest method of cleansing the ear.

The history of this ear trouble is quite uniform. It usually begins in

¹ Annals of Otolaryngology, Rhinology and Laryngology, September, 1920.

childhood with one of the exanthemata, and continues discharging, with occasional quiescent periods, and exacerbations when acute rhinitis supervenes. This is largely due to the increased nose blowing indulged in during inclement weather and "colds."

Treatment consists primarily in correction of the faulty nose-blowing habit and this alone will cure a large number of cases. The patient is taught to blow his nose without closing *either* nostril. Where this does not suffice, tonsils and adenoids are removed, deviated septa straightened and local treatment usually results in cure. Radical operation is not indicated except as a last resort. Under local treatment, Lillie recommends gentle mopping of the ear and drying it with air; then instilling boric acid and alcohol and again drying with air.

THE MASTOID.

Latent Mastoiditis, where the aditus and antrum are very large, and where there is neither pain, edema nor swelling is described by Guisez.¹ In spite of the absence of classic symptoms in these cases, there is suppuration in the mastoid cells. Often, the only sign of such invasion is the great amount of the aural discharge and the absence of a tendency to diminish as in the usual case. Pus that continues for eight or ten days to flow in great quantity cannot be due to middle ear involvement alone and indicates removal of the mastoid cortex. Though pain is absent, there is frequently a sense of heaviness in the ear and mastoid and the patient presents evidence of mild sepsis.

Layton² does not operate in the first stage of mastoiditis when the antrum only is inflamed secondarily to middle ear suppuration. Such a case is often amenable to medical treatment. When suppuration of the mastoid cells occurs, with ulceration and acute osteitis, operation is called for. The difficulty is to decide when the first stage passes into the second. Swelling behind the ear, if of middle ear origin, is a positive operative sign. Failure to operate at this point will subject the patient to the danger of intracranial involvement. In the presence of meningitis, operation is imperative but is not considered good surgery. Good surgery calls for earlier operation before this complication arises. Sagging of the postero-superior canal wall is a sign that should not be ignored, although it does not always mean that an operation is necessary.

Simple Mastoidectomy with Local Anesthesia has become more popular with American surgeons since its extensive use in the army, where, in so many cases, the presence of serious respiratory diseases contraindicated ether. Koebbe³ has used the method with entire success in 72 consecutive cases and believes it always preferable to ether except in the case of young children. Many of his patients have been so comfortable that they have fallen asleep during the performance of the operation. Preoperative preparation of the patient is carried out as for an ether anesthesia, except that only one meal is omitted before operation.

¹ Bulletin d'Oto-Rhino-Laryngol. et de Broncho-Esoph., March, 1921.

² Lancet, April 9, 1921.

³ Journal of the American Medical Association, May 14, 1921.

Morphine and atropine are given one-half hour previously and the patient is not brought into the operating room until all preparations are completed and the operator is ready to begin work. It is very important to see that the patient is in an entirely comfortable position on the table, and as psychology plays an important part here, the surgeon carries on a conversation with the patient on subjects foreign to surgery. The technic is much the same as that given by other surgeons. One per cent procaine solution is used, with 1 or 2 drams of 1 to 1000 epinephrin solution to the ounce. These two solutions are sterilized by separate boiling. The subcutaneous tissues are infiltrated first, beginning at a point posterior to the external meatus in the line of incision, and following this line to its most upper and anterior point and then downward, anterior to the pinna to the level of the tragus. The lower part of the line of incision is next infiltrated to about an inch below the mastoid tip. At this point, a slightly deeper injection blocks the great auricular nerve. Another deeper injection just below the tip of the mastoid blocks the posterior auricular nerve. The branches of the small occipital nerve are blocked by injections placed $1\frac{1}{2}$ inches posterior to the external meatus, and the needle, introduced from behind the ear, anesthetizes the posterior canal wall nearly to the tympanic membrane. This step is very important. Finally, the needle is introduced under the periosteum of the mastoid in various places and the whole covering of the mastoid infiltrated. This is all done before the skin incision is made and no further anesthetic is required. From 6 to 8 cc of the procaine solution is needed to complete the infiltration.

The Modified Blood Clot Dressing used by Coates¹ was barely mentioned last year. It is used in all cases where postauricular drainage of the middle ear is desirable, except when, for any reason such as suspected intracranial involvement, it is thought wise to keep the operative field under observation, or where an intra- or extradural abscess, or an infected lateral sinus appears as a complication. This method combines the quick healing, absence of deformity and ease of dressing of the original blood-clot method, with the advantage to the hearing function secured by a few days mastoid drainage. Aseptic precautions must be rigid and the diseased mastoid thoroughly cleaned surgically, and flushed with hot normal saline solution. A cigarette drain is now placed in the wound with its inner end against the antral orifice of the aditus, the wound allowed to fill with blood and the skin sutured from top to bottom except where the drain protrudes directly external to the antrum. This exit is chosen in order that there may be no kink in the drain, and that it may be in contact with as little of the blood clot as possible in order to minimize the danger of infection. The drain itself is easily prepared by the clinic nurse but should conform to certain specifications. It is made of a 1 inch gauze bandage folded twice and covered with rubber tissue cemented at the edge, so that its diameter is about $\frac{3}{16}$ of an inch. Care must be taken when suturing the skin, and at dressing time, not to dislodge the drain from its position in the aditus,

¹ Pennsylvania Medical Journal, April, 1921.

as in that event there is added danger of clot infection, and, of course, defective drainage. The drain is allowed to remain for a short time after the middle ear becomes dry, usually from one to five days, and then gently slipped out with no discomfort to the patient. If the drain is not delivering secretion after a few days, it is removed irrespective of the middle ear condition. In any case, the skin edges come together promptly and the scar becomes linear, no permanent record of its insertion remaining. Sutures are removed at the earliest practicable moment, first painting with iodine, and always observing the strictest asepsis and greatest gentleness.

It is claimed that with this method, there is no pain from removal of or changing packing and that healing takes place rapidly. With a *successful* blood-clot dressing, the patient is frequently discharged on or before the seventh day with a dry ear, a closed wound and no deformity. Sometimes by this combined drainage and blood-clot method, a longer time than this is required in a successful case, but at no time is there any painful packing or dressing, and the most timid child or adult gives no trouble. The percentage of successful cases is from 80 to 85. If the clot becomes infected there is no danger to the patient. The wound is opened, the débris cleaned out without trouble and the wound packed in the usual manner. No time has been lost and no additional hazard added, the wound in fact granulating more quickly. Usually, however, but a small portion of the clot liquifies, so that by removal of a stitch, or slightly separating the skin edges, enough drainage is obtained to clean the small cavity and the case goes on to recovery with but little delay. If an intracranial complication develops, the partially organized clot can be rapidly removed and the parts inspected or explored through a sterile wound.

Ersner,¹ in discussing this paper and speaking of the function of the blood clot says that mechanically it fills up the dead space of the mastoid cavity, preventing deformity and infection. When the blood coagulates, organization takes place in the clot and fibrinous tissue is formed. This acts as a temporary scaffold until granulation tissue forms from the bone which in course of time is replaced by fibro-connective tissue. Osteoblasts eventually convert this into bone. This final outcome has been confirmed by *x-ray*, and by one or two secondary operations. Ersner thinks also that as intravascular blood contains various immune products that control infection, it is reasonable to suppose that extravascular blood in the form of a clot may have the same, or possibly even greater, bactericidal action.

Experimental studies of bone repair after an infectious process are detailed by Nichols.² It was found that the walling-off of infected bone from sound bone was done partly by granulation tissue derived from the connective tissue of the bone-marrow, and partly by new bone derived from the endosteum. In the treatment of osteomyelitis (as in mastoiditis) the underlying principal is bone drainage. If done sufficiently early, the defect produced by suppuration may be repaired

¹ Pennsylvania Medical Journal, April, 1921.

² Transactions of the American Otological Society, 1920.

by proliferation of granulation tissue and endosteal cells. In later stages the endostinum will form new bone and fill the bone defect.

Hammond¹ advocates a new method of mastoid closure that obviates long-continued packing and ultimate deformity. The mastoid wound is well, but not tightly, packed with gauze to facilitate the escape of pus from the middle-ear. The usual wick in the external canal is also employed. The mastoid packing is allowed to remain for five or six days, if it appears quite dry, but if it becomes moist, it must be removed and replaced. The cavity must be completely filled with packing. The packing is now changed daily until the middle ear is dry and the inner surface of the mastoid is covered with fine healthy granulations. After about ten days of this daily packing, the cavity and gauze should be quite dry. We now have a middle-ear which is no longer suppurative and a mastoid cavity lined with granulations and practically devoid of discharge. The next step is to completely fill this wound with boric acid. A pad of gauze is laid over the wound and the auricle gently, but firmly, held back against this pad with more gauze and a bandage. When the dressing is changed next day, the cut edges are found approximated and there is no discharge. In a week there will be a dry crust over what amounts to a linear scar, and the patient is well. There is never any need for secondary suture of the skin edges in this method. It combines many of the advantages of the blood-clot dressing with drainage mentioned above, but has the disadvantage of ten days' painful packing.

In this respect, it is interesting to note the time of healing obtained in the Royal Edinburgh Infirmary. Boyd² has analyzed the results of 188 consecutive cases of simple mastoid operation done by Logan Turner and J. S. Fraser during the years 1914-1919 inclusive. Of these 66 were dismissed in one month or less from the date of operation, but the average time of closure of the operative wound in the entire series was forty-two days. The shortest healing time was fourteen days in 2 cases, and in one case five months were required. This is markedly longer than the five to ten days required by the blood-clot method, and the fifteen to seventeen days by the Hammond technic. In 85 of these cases that were followed for a considerable period of time, very slight depression of the scar was found 52 times. In 18, the depression was noticeable and in 13 was marked.

In 35 of the 188 cases studied, there was no history of middle-ear discharge and in 18 additional, the discharge had ceased when the patient came under observation. This seems like an unusually high percentage of so-called "primary mastoiditis."

In observations on 25 cases of middle-ear and mastoid tuberculosis, Leegaard³ finds considerable difficulty in the diagnosis from the ordinary purulent type. The multiple perforation, usually considered pathognomonic, was only found once in this series but 5 times in a series of non-tubercular cases. He thinks this sign must be disregarded

¹ Transactions of American Otological Society, 1920.

² Journal of Laryngology and Otology, May, 1921.

³ Laryngoscope, June, 1921.

unless found in phthisical subjects where multiple perforations are rather common. A feature of importance is abundant and rapidly recurring granulations, but the granulations themselves show no variation from the usual variety. None of Leegaard's cases had facial paralysis, and he finds the presence of enlarged periauricular glands is confined mostly to infants and young children. While the granulations found in the mastoid are in no way characteristic, the presence there of a putty-like material, somewhat yellow-white in color, is considered actual proof of tuberculosis, but it is not always present. A painless onset of the disease occurred more frequently in non-tubercular cases than in the tubercular ones. The course after operation on the mastoid is much more characteristic than the findings at or before operation. These cases do not heal rapidly, but on the other hand, often show a long, narrow sinus with a small crust over the opening that may take a year or more to heal or that may not heal at all. The final and conclusive test is the histological and bacteriological examination of the discharge and the scrapings taken at operation, and the positive inoculations of guinea-pigs.

Intracranial Complications. EXTRADURAL ABSCESS AS A COMPLICATION OF ACUTE MASTOIDITIS is considered by Dench¹ as very common, very difficult of diagnosis before operation and so little important from the viewpoint of prognosis that its presence in no way increases the gravity of the latter. These cases almost invariably recover. The most frequent location is about the lateral sinus and in the middle cranial fossa. They give rise to few distinctive symptoms and are usually unrecognized until operation. Localized headache, sleeplessness, a higher temperature elevation than would be expected, an area of extreme localized tenderness on the skull or a higher percentage of polymorphonuclear cells in the blood count might lead one to suspect, but not to diagnose, this condition. Treatment consists in evacuating the abscess by removing all bone about the diseased dural area, and the after-treatment is identical with the treatment of the simple mastoid wound.

In cases of INTRADURAL OR CEREBRAL ABSCESS, Dench strongly advises opening and draining the abscess along the avenue of infection when this can be discovered. The results of operating in this manner are much better than if the brain is explored through a healthy dural area, in spite of the contentions of the general surgeons to the contrary. The reason is that by following the route of infection, particularly if there is a "stalk" present, the arachnoid space is found obliterated by inflammatory adhesions and subsequent meningitis from infection from the abscess does not occur. If no such avenue of infection can be found, however, it is better surgery to do a decompression operation in the temporal region, divide the dura and pack the subdural space with iodoform gauze for twenty-four hours to cause obliteration adhesions. After this, the temporal lobe can be thoroughly explored with materially lessened danger of meningitis if the abscess is discovered. The pre-

¹ Laryngoscope, July, 1921.

liminary decompression relieves the intracranial pressure and the dangerous symptoms caused by it, and this relief of pressure in one particular spot probably induces the pointing of the abscess in this direction and its more easy detection. The brain should always be explored with a grooved director, and when the abscess cavity has been located, a pair of forceps, introduced closed and withdrawn open gives the best enlargement of the opening. Suction is considered useful in removing all pus and brain sloughs. A cigarette drain, gradually withdrawn, completes the treatment.

The treatment of CEREBELLAR ABSCESS is along the same lines as above. There are added difficulties in the point of attack, however. As the majority of abscesses of the cerebellum arise by way of the labyrinth, an attempt should always be made, in opening an abscess, to remove the posterior surface of the petrous pyramid and to inspect the dura in front of the sinus. If necrotic dura is found, the cerebellum may be explored through this area. Frequently this is impossible because the forward location of the sinus does not give the necessary space for exploration, or for drainage if the abscess is found. The cerebellum can then be explored posterior to the sinus or directly through the sinus if it is found to be obliterated by disease, as occasionally happens. This gives the best approach of all. This has suggested to Ballance, Eagleton and others, that obliteration of the sinus may be artificially accomplished for this purpose. Dench does this by passing two deep sutures around the exposed sinus, one just below the knee and the other just above the bulb. These are tied over gauze plugs lying on the outer wall of the sinus. Satisfactory obliteration of the sinus is thus secured and ample space for exploration and drainage provided.

Meningitis is divided according to the old classification, into two classes, serous and purulent, although the former is but a milder form or an earlier stage of the latter in most instances. In the serous variety, there is undoubtedly mild infection, produced by pathogenic organisms, or possibly by their toxins, and it may terminate favorably, which the purulent variety almost never does. The symptoms are identical in each class except in degree. The classical symptoms are too well known to need repetition here, although there are atypical cases where the diagnosis is at times obscure. This difficulty is confined to the early stages, and is most important, because it is during the early stages only that operative interference may be successful.

Surgery, to be of benefit, must primarily remove the focus of infection, and then expose large areas of dura through the mastoid wound, for drainage. The dura is not incised by Dench although Crockett several years ago, before the American Laryngological, Rhinological and Otological Society, reported excellent results by this method. Dench, however, believes there is some virtue in large doses of urotropin given by mouth. He concludes by saying that occasionally a case of meningitis is saved. The fact that most of them die in spite of operation should not deter us from making every effort to save the individual case, and for this reason operation is urged in every instance where this condition exists.

THROMBOSIS OF THE LATERAL SINUS presents so many diversified symptoms that the diagnosis is often one of great difficulty and can be made only by a combination of various signs and symptoms. In a case of mastoiditis with numerous excursions in temperature extending over a number of days, it is perfectly justifiable to make a diagnosis of sinus thrombosis, even though the blood culture remains negative, and in doubtful cases it is wiser to explore the sinus and ligate the vein than to wait indefinitely for a positive blood culture.

Excision of the internal jugular vein is recommended over simple ligation on the ground that there is always a phlebitis beyond the limits of the clot, and there is thus danger of the pathological process continuing below the ligation. If simple ligation is done, the ligature should be placed above the facial vein as otherwise infection might be forced into the general circulation through this channel. Ligation is not always, or even often, a simple matter, being complicated by the enlarged glands which overlie the vein at the level of the facial tributary. The danger of dislodging a clot in curetting the lower end of the sinus, makes the ligation of the vein a wise procedure in every case where the sinus is about to be interfered with.

Barnhill¹ comments on the fact that in many cases of *atypical sinus thrombosis*, there is an almost complete absence of ear symptoms. It is not necessary for a diagnosis that there should be a discharging ear and great pain, and swelling and tenderness along the neck over the course of the internal jugular are rarely present, and then only in the late and fatal cases. In many cases mastoid tenderness is absent and in a rather small percentage are actual chills noted, although chilly sensations are common and considered of great value in diagnosis, although too frequently overlooked.

Thrombosis of the lateral sinus resulting from middle-ear and mastoid disease may occur in the following ways, according to Braun, quoted by Hill:²

"1. The inner table of the mastoid over the sinus may be diseased and an abscess formed between the sinus and the inner table. This results in an inflammation of the true sinus wall, which eventually leads to the formation of a thrombus within the sinus.

"2. The inner table over the sinus may be diseased and cause an extension of the inflammatory products to the sinus wall without the intermediation of a perisinus abscess. The phlebitis results in a thrombus formation.

"3. A thrombus may form in one of the smaller veins of the mastoid and extend into the lateral sinus."

The usual course of events is necrosis of the sinus wall and destructive changes in the endothelial lining. Bacteria in the vessel wall set free toxins which pass into the blood stream and there is also an increase in the agglutinability of the blood platelets and an increased coagulability of the plasma, which, with the destruction of the intima, make up the main factors in sinus thrombosis. The bacteria are found mostly

¹ Medical Record, 1920, 98, 388.

² Annals of Otology, Rhinology and Laryngology, December, 1920.

in the peripheral portions of the thrombus which indicates that the latter is formed before the bacteria themselves enter the blood stream. Thrombi may be either obliterating or parietal, though they are all, probably, parietal at the onset. The thrombus that remains parietal for some time is considered the more dangerous as it is constantly being washed by the blood stream, and if old enough to have collected bacteria, there must be danger of these entering the general circulation.

A delayed or an incomplete mastoid operation is too frequently the cause of sinus thrombosis. The portions of the mastoid usually overlooked are given by both Dench and Hill as the cellular area just internal to the prominence of the digastric fossa and in the angle between the floor of the middle fossa and the knee of the sinus. These are the favorite sites for a beginning perisinus abscess.

As an aid to diagnosis, Hill mentions "Greisenger's sign," which is also designated as "Crowe's sign" by Martin.¹ This is demonstrated, according to the latter, in the following way: Pressure on the jugular vein of the uninvolved side causes a marked increase in the dilatation of the veins of the fundus, as seen with the ophthalmoscope, and a marked increase in size of the superficial veins of the forehead, eyelids and temples. All these veins immediately empty when the pressure on the internal jugular is released, thus demonstrating that there is no obstruction to the blood current on that side. Similar pressure on the involved, or obstructed, side has no appreciable effect on either the retinal or superficial veins. If both internal jugulars are simultaneously compressed, the superficial and retinal veins immediately fill up; release of pressure on the obstructed side has no effect, while release of pressure on the uninvolved vein causes them to empty at once.

Hill thinks this sign is rarely demonstrable, but it is conceivable that it might be of the greatest aid, in a case of double mastoiditis, in determining which side should be explored.

Undoubtedly many cases of lateral sinus thrombosis undergo spontaneous cure without ever having been recognized, but almost without exception they run a stormy course. Naturally, once the diagnosis can be made, it is bad surgery to wait for any such result, as the chances are far too slim. As soon as the diagnosis can be made, operation should be resorted to, for the earlier operation is done, the greater the chance of recovery for the patient. As Dench points out, it is better, often, to investigate, surgically, the doubtful cases, then to wait for a confirming positive blood culture, for the patient on whom a late operation is performed, although eventually cured, undergoes a protracted and anxious convalescence.

Hill believes that simple ligation of the internal jugular vein is usually sufficient, particularly if done early in the disease, while Dench resects as a routine measure. Which ever procedure is adopted, it should be done before there is an interference with the contents of the sinus, in order to prevent the entrance of detached infectious material into the circulation. Simple ligation has certain advantages over resection.

¹ Laryngoscope, December, 1920.

It can be done in a much shorter time, with less attending shock to an already sick patient, and it requires a much smaller incision. If this is made transversely, as advocated by Hill and by most surgeons for any exploration of the neck, the resulting scar is scarcely visible. The use of nitrous oxide and oxygen anesthesia also materially reduces shock and is most satisfactory.

Hill performs the ligation in the following way. The head is turned toward the opposite shoulder and a sandbag placed under the neck to put it on the stretch. A small horizontal incision, not over $1\frac{1}{2}$ inches long, is made in a deep crease of the neck in the superior carotid triangle, at the level of the thyroid, just anterior to the border of the sternocleidomastoid muscle. The incision is carried through the platysma, retractors introduced converting the skin wound into a vertical one and the dissection continued with Mayo scissors just anterior to the sternocleidomastoid muscle. The carotid sheath is exposed, entered, and the internal jugular vein isolated from the carotid and the pneumogastric nerve. A double ligature of chromic cat-gut is placed around the vein, the strands separated about half an inch and each firmly tied. The skin wound is now closed, and the sinus operation can be continued.

Hill's conclusions are that:

1. The best prophylaxis for sinus thrombosis is through exenteration of the mastoid as soon as a diagnosis of suppurative mastoiditis is made.

2. Despite early and thorough surgery, sinus infection will occur in certain cases because of the virulence of the infection or the low resistance of the patient.

3. Operative interference should be instituted as soon after sinus infection has taken place as possible. Early operation will avoid a much prolonged and stormy postoperative period.

4. If performed early, the ligation of the internal jugular, followed by exploration of the sinus and removal of its external wall, would seem sufficient. The horizontal crease incision leaves the best cosmetic result.

5. Temperature is the most important symptom. If otherwise unaccounted for, a septic temperature in a mastoid which has been thoroughly exenterated, should be considered an indication of sinus infection. Other conditions which might possibly cause a bacteriemia being ruled out, a positive blood culture makes the diagnosis certain. Chills, the blood picture, localizing signs, etc., are important, if present.

6. Operation should be performed as soon after the onset of the infection, as shown by the temperature, as it is possible to make a diagnosis.

Motion Sensing. It is a well-known fact among aviators that in a fog or cloud, the pilot is at times unable to perceive that the air ship is off the even keel or that there has been a change in direction. Aviators say that there is a tendency to nose up or climb, in a cloud, and it is common practice to listen to the engine to hear if it is laboring with the strain of climbing, and to the purr of the wires to judge whether speed is being gathered by an inclination downward.

In ordinary daylight flying, an aviator keeps his ship in position by his sense of sight, his balance sense, his muscle sense, and the deep sensibility tracts. Information comes to him from the wind through his tactile sense, and from the engine and wires through his sense of hearing. The

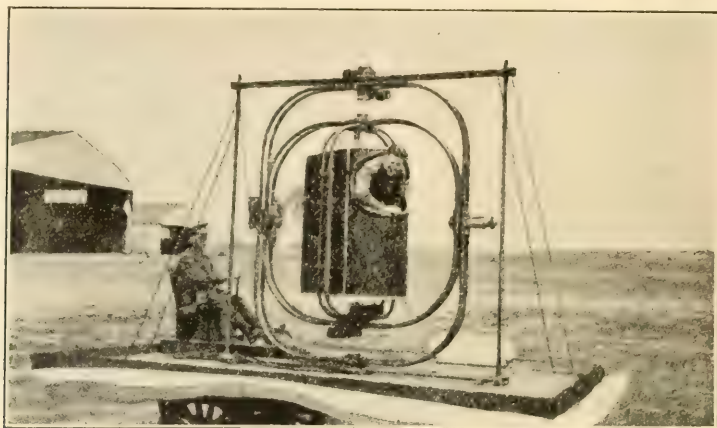


FIG. 30

two most important, however, are sight and the balance sense.. On a dark, starless night or in a cloud, sight is cut off and the aviator must depend almost entirely on his balance sense to keep in flying position. Hunter¹ believes that this sense can be cultivated and trained, just as

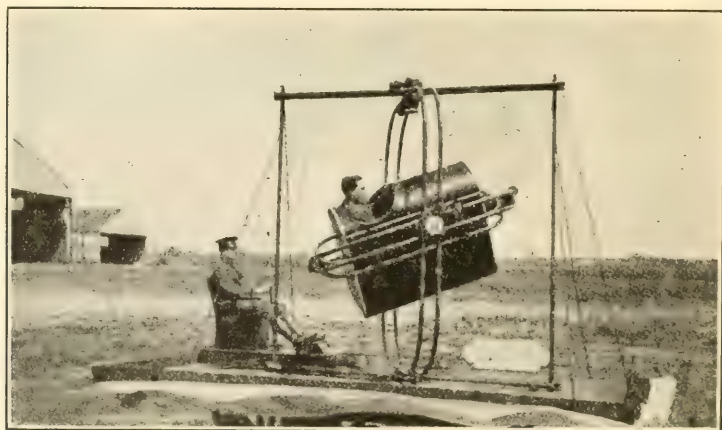


FIG. 31

any of the other special senses may when called on to compensate for the loss of another sense.

His proposed method is to have the aviator fly blindfolded for a certain

¹ Laryngoscope, April, 1921.

length of time daily in a double control plane. This would put the pilot in the same situation as he would be in if in a cloud, but the second pilot would be available to prevent accidents. This idea should have some practical value since pilots at their first experience in cloud or night flying are very apt to become confused, while repetition of trips under these conditions tend to teach them proper control.

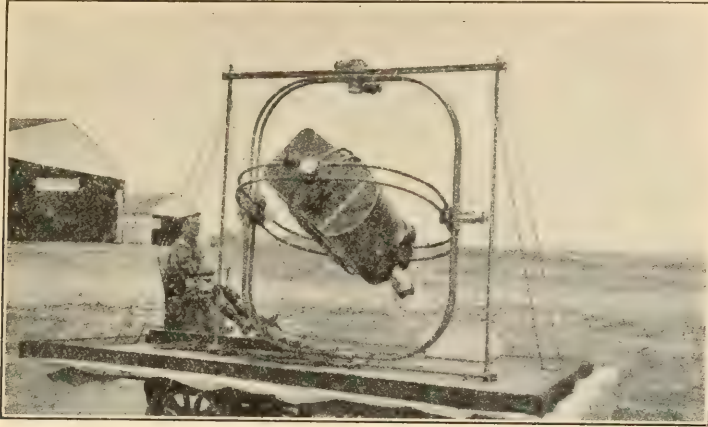


FIG. 32

Martel and Jones¹ agree that fliers should be trained blindfolded, in this way becoming more and more keen in the sensing of motion as well as comfortable and efficient while flying at night or in a cloud, and also becoming familiar with vertigo sensations. The one big asset to the flier is confidence and until his vestibular sense has been thoroughly educated, he cannot have this, and the "orientator," devised by Ruggles, and mentioned last year, is recommended for giving this training to the aviator on the ground instead of "throwing him into the air" to get it, a method hitherto productive of many crashes and deaths. This "orientator" is in reality a perfected turning chair that will revolve in all conceivable planes about a central point. This permits doing the "otologic" part of flying before going into the air at all, and also trains the eye and all the other senses concerned in flying. It does not teach the pupil to fly, but does duplicate all the stimulations produced in the spins, spirals, loops and all turning evolutions possible in the air. In addition, the orientator produces much more violent and unusual turning sensations than can possibly be encountered in the airplane, so that the pupil is safeguarded by becoming familiar with sensations more intense than he can possibly encounter in the air.

¹ Annals of Otolgy, Rhinology and Laryngology, December, 1920.

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